

THE SYDNEY COUNTY COUNCIL

SYSTEM OPERATION BRANCH

EMERGENCY SERVICE OFFICERS' HANDBOOK

ISSUED BY

THE OPERATING ENGINEER

ISSUED TO _____

BOOK NO. _____

I N T R O D U C T I O N

This handbook is issued for the guidance of Emergency Service Officers and contains all those parts of Branch Standing Instructions with which they are directly concerned, together with technical and other information which may be of assistance in the course of their duties in rendering emergency service.

The book is divided into Sections and the Sections into Items with numbered Paragraphs.

Closely related subjects are grouped in each Section.

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SERVICING OF ELECTRICAL APPARATUS BY
THE SYDNEY COUNTY COUNCIL

ITEM NO. 1 - GENERAL

1. Apparatus Sold

The Appliance Repair Section of the Electricity Development Branch will provide or arrange for service to electrical apparatus and associated wiring or plumbing which are normally sold to customers by The Sydney County Council. Service will be given subject to certain limitations irrespective of whether the apparatus was purchased from The Sydney County Council or purchased privately.

2. Loan Equipment

- (i) The Council has a certain number of cookers, stovettes, pie warmers, urns, griddle plates, and wash boilers which are loaned if the customer's equipment or part is removed for repair.
- (ii) Several heavy flexible leads are also available for use in special circumstances, e.g. where the apparatus sub-circuit is faulty.

3. Hours in which the Appliance Repair Section Staff Work

(a) Hornsby, N.A.E., W.A.E., E.A.E., and Bankstown

Mondays to Fridays 7.30 a.m. to 4.15 p.m.

Saturdays A limited staff work from
7.30 a.m. to 1.30 p.m. each
Saturday on overtime.

(b) Miranda

Mondays to Fridays 7.15 a.m. to 4.00 p.m.

(c) Saturdays - Urgent Appliance Repairs after 12.00 Noon

Appliance Servicemen working on Saturdays from the above listed depots will contact the Despatch Officer - Co-ordination by radio to ascertain if there are any urgent jobs requiring attention before ceasing work in the field.

4. Requests Received After Hours

- (i) Outside the hours when the Appliance Repair Section staff is working, all calls for service to apparatus normally serviced by the Appliance Repair Section shall be dealt with by the Emergency Service Section.

- (ii) With most requests, arrangements can be made for an appointment for an Electricity Development Branch Technician to visit on the next working day but arrangements shall be made for an Emergency Service Officer to attend where the customer is considerably inconvenienced and assistance could possibly be rendered by him.

5. Calling Out Electrical Fitters and Plumbers after Hours

- (i) During hours when the Appliance Repair Section is not attended, Electrical Fitters and Plumbers attached to that Section may be called out from home on occasions of extreme urgency to repair apparatus normally serviced by the Appliance Repair Section, provided that, where necessary, an Undertaking Form is first signed by the customer. Note: All labour is charged at cost of call out.
- (ii) Before Fitters or Plumbers are called out, the Despatch Officer Co-Ordination shall be informed of the circumstances, and authority in each instance shall be obtained from the Apparatus Service Engineer. In his absence, the matter shall be referred to the System Operator.

6. Customer Demanding Same Day Service

- (a) The following procedure will apply to customers demanding same day service:

If the job will be coded back before noon, the customer can be informed that attention will be given that day.

If after noon and before 4.00 p.m., officers will contact E.D.B. Despatch staff by telephone if the customer has a telephone and is agreeable -

269 2258 - Five Dock, Chatswood, Hornsby E.D.B. Depots,
269 2256 - Bankstown, Miranda, E.A.E. E.D.B. Depots,
or via the radio telephonist if telephone is not available.

Note: These telephone numbers must not be given to customers.

E.D.B. Despatch will advise if service can be given on the day or not and if it will be at overtime rates or not. (Obviously if overtime for the same day is suggested and the customer is not agreeable, then the next day would be applicable at ordinary rates. E.D.B. Despatch may nominate - not today but 1st job tomorrow.)

After 4.00 p.m. Officers will advise the customer that service will be given on the next working day. First call a.m. will not be promised, however a.m. or p.m. may be nominated if the customer is going out etc. It is essential that any such arrangement be coded back to the radio telephonist with the job code.

- (b) On Saturdays between 12.00 noon and 5.00 p.m., in all areas, contact should be made with the radio telephonist who will ascertain if there are any Electricity Development Branch technicians still working in the area who would be available to carry out an urgent job.
- (c) On Sundays and public holidays, generally advise customers that Electricity Development Branch technicians will call next working day and return applicable code (refer, also, to Item 5 above).

7. Appointments for Appliance Repair Section

(a) Urgent Calls - All Areas

To enable same day service to be given wherever practicable, the Emergency Service Officer shall deal with these calls as follows:-

Ordinary work-day 7.30 a.m. to 4.00 p.m. and Saturday 7.30 a.m. to 12.00 noon.

Contact E.D.B. Despatch or radio telephonist (refer Item 6 above).

Customers wishing to personally arrange for time of service or to discuss the cost of repairs shall telephone Head Office with pink card 1565 in hand showing listed defects.

(b) Other Calls - Electricity Development Branch to Attend On Ordinary Work-Day.

(i) The Emergency Service Officer shall make an appointment for an appliance serviceman to call on the second work-day from the date of his call, or on a later ordinary work-day more suitable to the customer. Such appointments may be marked a.m., p.m., after 10.00 a.m., before 2.00 p.m., or after 2.00 p.m. etc.; provided there is reasonable justification and the information is accurately coded back to the radio telephonist. "After 2.00 p.m." would be the latest booking made of this type and "1st call a.m." will not be promised.

Occasionally seasonal commitments may make it necessary to issue instructions varying the dates for which System Operation Branch may make appointments for visits by Appliance Servicemen.

(ii) The Emergency Service Officer shall mark on his Run Sheet details of any appointments for Appliance Servicemen.

(c) Saturday Appointments

Where an appointment is made for a Saturday at the request of the customer, the Emergency Service Officer shall advise the customer that an overtime charge is made for appliance service labour on Saturdays, except that no charge may be made:-

(i) Where the customer states that recent appliance service by the Council was ineffective and the Council's records confirm this (recent service is defined as service to the same appliance within one month).

(ii) The appliance is a "Council Sale" in guarantee.

(d) Tenanted Premises

The Emergency Service Officer shall check with all customers as to whether they are owners or tenants of the premises.

Tenants shall be informed that, unless they are prepared to accept responsibility for payment of any account which may be rendered, the request for service should be made through the owner or agent.

The fact of the person who expresses willingness to accept the account being owner or tenant shall be reported on the Emergency Service Officer's Run Sheet.

It should be noted that the Council has a general authority from the Housing Commission of New South Wales to repair appliances in the Commission's tenanted homes.

8. Shocks from Apparatus

Reports of electric shock from any apparatus will be dealt with directly by the Emergency Service Section. The Emergency Service Officer investigating a report of electric shock shall take action as is set out in Branch Standing Instruction No. 3110 (See Section No. 14 of this Handbook).

9. Identification of Premises

Emergency Service Officers visiting premises at which officers of the Appliance Repair Section will be required to attend will detail the means of gaining access and the address clearly on their run sheet if any difficulty would be experienced in identifying the premises.

ITEM NO. 2 - SCOPE AND CONDITIONS OF APPARATUS SERVICE

1. Scope of Service

Service by the Council to customers' apparatus is limited as follows:-

(a) Types of Appliances ServicedDomestic Appliances

- Ranges
- Storage hot water systems
- Free outlet push through heaters with components similar to heaters sold by the Council (Simpson, Langco, old style Rowco, B.G.E.). Other makes refer customer to supplier or retailer.
- Clothes wash boilers, all ratings.
- Instantaneous water heaters - refer customer to supplier or retailer.
- Minor Appliances - minor appliances may be repaired at the customer's premises if the appliance is too bulky for easy carrying. Otherwise, minor appliances shall be delivered to showrooms by customers.

Note: Requests for service to refrigerators and washing machines sold by the Council are referred to the supplier. All other appliances refer customer to supplier or retailer.

Industrial and Commercial Appliances

- All Council sales.
- Non-Council heating or cooking appliances; where service is readily available from supplier, it is preferable that the customer be referred to the supplier who is able to give more specialised attention; this procedure should, in particular, be observed in the cases of a specialised nature, e.g. bread cutters, mixers, electrically heated machines, large industrial ovens, etc.

Except as provided elsewhere in this outline, only to appliances connected to the Council's supply.

To normal service work, not including major reconditioning.

It is not intended that these limitations shall prevent the Council giving service of an urgent nature or advising a customer or contractor where difficulty is being experienced in obtaining satisfactory operation from an appliance or its installation.

(b) Service not to be Undertaken

The Council's service to customers' apparatus shall not cover:-

- (i) Work on customers' unused apparatus that has not been sold by the Council to make it comply with the S.A.A. Wiring Rules, or major alterations to such apparatus. In such cases, the customer should be advised to contact the retailer or supplier.

(ii) Work associated with the connection, disconnection or alteration to position of existing apparatus, except as provided in Clause (4) and except that work such as the disconnection and reconnection of a range for laying of lino, etc. may be undertaken but all labour shall be charged. In all other cases, the customer shall be advised that arrangements for disconnection should be made with a licensed electrical contractor who is required to arrange for inspection by the Council.

(iii) Any further work on apparatus which has been repaired by a private firm or individual to make it suitable for use. In such cases, customers shall be advised that the work should be completed by the firm or individual.

(iv) Work on the customers' electrical and plumbing installations, except as provided for in Clause (3).

(c) Calls to be referred to Supplier

Where a supplier so requests, all calls for service on Non-Council sales inside the guarantee shall be referred to him; service may be given, however, if the customer asks the Council to service the appliance on the understanding that this may render the guarantee null and void, and the customer meets all charges.

(d) Inability to Service (Specific Apparatus)

The Council may decide for various reasons that it is unable to service a particular type or make of apparatus. The staff will be advised of any such special arrangements from time to time.

2. Council Sales to Employees not connected to S.C.C. Supply

(a) During the Guarantee Period

The defect shall be repaired or a new part will be supplied to the employee at no charge, provided the defective part is first returned to the Council. All other requests for service shall be referred to the supplier.

(b) Outside the Guarantee Period

New components will be supplied to the employee at list price at the Council's Appliance Repair Section, or will be repaired at full charge provided the employee returns the defective part to the Appliance Repair Section, and takes delivery from there when the repair is completed.

3. Service to Customers' Installations

(a) Council Sales - Inside the Guarantee Period

Requests for service shall be referred to the installing contractor except that Council will attend to the following types of calls at no charge:-

(i) Service of an emergency nature to ensure that the customer continues to receive service from the apparatus, such as replacing switch-fuses or wash boiler wall switches, repairing minor leaks in hot water pipes, etc., in which case the material used or its value may be recovered from the contractor or supplier.

(ii) Replacement of tap washers on sink heaters and hot water service installations where installation is sold by S.C.C.

(iii) Rectification of minor defects in the installations found while making a normal service call, such as repairs at adjacent junction box and between box and apparatus.

(b) Council Sales - Outside the Guarantee Period

The customer shall be advised to seek the services of a contractor except that the Council may attend to service calls of the type listed in Item 3. In such cases the customer shall be charged for all labour and materials.

(c) Non-Council Sales - Inside Guarantee Period

The customer shall be referred to either the retailer, contractor or manufacturer, as applicable, and not to the Electricity Development Branch, as the S.C.C. cannot now recover labour costs entailed from the manufacturers concerned.

4. Service to Council's Hired Apparatus - Schools Only

Hired apparatus to schools the property of the Council. No charge shall be made for service to the apparatus.

5. Urgent or Advisory Service

(a) Scope

(i) Service of an urgent or advisory nature may be given on types of apparatus and installations not normally serviced by the Council where it is established that:-

A. In the case of a Non-Council industrial or commercial sale, production is held up and the customer is unable to obtain urgent service from a service firm or contractor or similar cases of urgency.

B. The customer has been unable to obtain satisfactory operation from his apparatus or its installation after several service calls from a firm or contractor. Care shall be taken that the Council is not used to judge the work carried out by a private firm or contractor and, where practical, the firm or contractor shall be contacted by a supervisor before a call is made.

(ii) When making a call of an urgent or advisory nature, minor repairs which it is considered will not require more than two (2) man-hours' labour may be undertaken. If this limit is likely to be exceeded, the customer shall be referred to a private firm or contractor.

(b) Authority

Authority for service falling within this category shall, in each instance, be obtained from the App.S.E. or, in his absence, from the next senior supervisor but, in any case, all service of this type shall be reported to the App.S.E.

6. Priority of Work

- (a) It is aimed to complete normal service calls (involving one man only) within two working days. Heavy fluctuations in work may not, however, always allow this to be done.
- (b) Several days' delay may occur if two men or special materials are required.
- (c) In special cases, where hardship exists or on the consumers' insistence, same day service is given. Examples - industrial and commercial service; sickness requiring hot water; oven grills; etc.; large hotplate on 2-hotplate range; range isolated; hot water for doctor's surgery; etc.

ITEM NO. 3 - CHARGES FOR APPARATUS SERVICE

Details of prices for labour and materials used in Apparatus Service are set out in the price list. The basic policy covering charges for these services is as follows:

1. Hired Apparatus - Schools Only

NO CHARGE FOR LABOUR OR MATERIAL.

2. Council Sale (Appliance or Part)

(a) In Guarantee

No charge for labour when technician rostered for work except that charge may be made for parts if supplier not prepared to replace at no charge due to incorrect use; etc.

(b) Outside Guarantee

Labour. Within two (2) years from date of connection -
No Charge.

After two (2) years - Charge all labour.

ApparatusMaterials

Domestic Range or
Hot Water Service
Commercial and Industrial
Cooking Equipment

List Price

Domestic Wash Boiler or
Free Outlet Push Through
Heater.

List Price

Other Apparatus

List Price.

3. Non-Council Sale(a) In Guarantee

See Page 6, Item 3 Paragraph (C)

(b) Outside Guarantee

All Apparatus. Charge all labour.

Materials. List Price.

4. Labour Charges(a) Saturdays and Public Holidays

Except in special circumstances, such as Council sale defective shortly after delivery or previous non-effective service, a charge is made for labour as follows:-

When staff are not rostered to work. Total direct labour associated with the call-out less normal repair time necessary to carry out the repairs plus 50% on cost.

(i) Council Sale Under Guarantee

No charge when staff rostered. Charge to cover overtime on all labour on public holidays.

(ii) In all other Cases

All labour charged at normal charge, plus charge to cover overtime, additional charges for call-out (total direct labour associated with the call-out plus on cost at ordinary rates).

(b) No charge is rendered for Labour where:-

- (i) The service has been in the nature of advice only.
- (ii) The customer has received no benefit from labour expended.

5. Repair of Electric Radiators with Particular Reference to Housing Commission Tenants.

The Sydney County Council repairs electric radiators as is done with other minor appliances. If the customer is able to deliver the radiator to a showroom and later collect it, he is expected to do so.

If the customer cannot manage the transport of the radiator, probably because of its size, the Electricity Development Branch Appliance Repair Section will pick up and deliver the radiator. A charge of 50c each way (total \$1.00) is made for this service in addition to the cost of repairs.

If the radiator is "built in" to the premises, and sometimes when it is merely bulky, the repairs may be carried out at the premises at the time of the initial visit. The customer is then charged for the time and parts involved.

Tenants in normal Housing Commission premises have to pay their own costs of repairs in the same way as any other Council customer. However, tenants of Housing Commission Aged Persons Units only have the costs of repairs to their radiators borne by the Housing Commission. The Commission has an arrangement with the Council for these charges to be made direct to the Housing Commission.

Officers' receiving calls in the Emergency Service Room should not enter into any discussion regarding costs of repairs with customers, particularly Housing Commission tenants, but should merely prepare a Service Request Card for a visit if requested and leave the matter of costs involved to the Appliance Repair Section.

SECTION NO. 2
SERVICE TO ELECTRIC RANGES

- Item No. 1. General.
2. Handling of Requests for Service to Electric Ranges.
3. Action to be taken by Officers Attending Electric Ranges at Customers' Premises.
4. Shocks from Electric Ranges.
5. Disconnection of Electric Ranges.
6. Emergency Service to Built-In Ranges and Ranges Built on Platforms.
- (a) Built-In Ranges.
- (b) Ranges Built on Platforms.
8. "Belling" Type 47, 3 - Hotplate Range.
9. "Bridgebuilt" Utility, 2 - Hotplate Range.
10. "Bridgebuilt" Senior, 3 - Hotplate Range.
11. "Electrice" Type 2 - L, 2- Hotplate Range.
12. "Electrice" Type 3 - L, 3- Hotplate Range.
("Electrice" Model 3EL Range, see Item No. 41)
13. "Etnelec" 3 - Plate Range.
14. "G.E.C.", D.C. 334 and D.C. 438, 2 - Hotplate Ranges.
15. "G.E.C.", D.C. 113, 3 - Hotplate Range.
16. American Hotpoint Ranges.
17. "A.G.E. Hotpoint" Model L.M. 36, 3 - Hotplate Range.
18. "A.G.E. Hotpoint" Ranges.
19. "Hecla" Commercial Cooking Appliances.
20. "McClary" Ranges.
21. "K.F.B. Hotpoint" Ranges.
22. "Jackson" Ranges. Models No. 91JR and 92J.
23. "Jackson" Range. Model No. 192J/1.
24. "Jackson" Range. Model No. 193J.
25. "Jackson" Range. Model No. 192J/4.
26. "Magnet" Ranges.
27. "Metters" Ranges.
("Metters" Model EKL3 Range, See Item No. 43)
28. "Moffat" Ranges.

(Over)

- Item No. 29. "Parnall" Type EC6, 3 - Hotplate Range.
("Parnall" Models EC8, EC9, See Item No. 57).
- 30. "Ritemp" Cat. 2004S, 2 - Hotplate Range.
- 31. "Ritemp" Cat. H.C. 212, 2 - Hotplate Range.
- 32. "Ritemp" Cat. 2007V, 3 - Hotplate Range.
- 33. "Simpson" and "Rowco" Model No. 1 Range.
- 34. "Simpson" and "Rowco" No. 2 Model 3 - Hotplate Ranges.
- 35. "Simpson" Type E9, 2 - Hotplate Range.
- 36. "Simpson" Type E7, 3 - Hotplate Range.
("Simpson" Model E6, See Item No. 42).
- 37. "Rowco" LO2 Range.
- 38. "Xcel" Model K105/043, 3 - Hotplate Range.
- 39. "Thermentor" Automatic Oven Control.
- 40. "Sunvic" Simmerstat.
- 41. "Electrice" Model 3EL Range.
- 42. "Simpson" Model E6 Range.
- 43. "Metters" Model EKL3 Range.
- 44. "English Electric" Model 2009D and Model 2011 Ranges.
- 45. "St. George" Master Range.
- 46. "McIlwraith" Upright Cabinet Range.
- 47. "English Electric" Model 2020 Range.
- 48. "Hotpoint" Model RA2 Range.
- 49. "McIlwraith" Model E3 Range.
- 50. "Rowco" Model LOA2 Range.
- 51. "Simpson" Model E17 Range.
- 52. Automatic Timers and Minute Minders.
- 52(A) "Smith" Oven Timer - New Ringer Type Model C.C.U.
- 53. "Davell" Model C5 Range.
- 54. Roden "Chefmaster" Upright Cabinet Range.
- 55. Metters "K.F.B." Ranges - Models L75 upright and E75 elevated.
- 56. "Westinghouse" Ranges. Models C126, C127, C155, C157.
- 57. "Parnall" Ranges. Models EC8, EC9.
- 58. "Carmichael" Electrically Controlled Gas Range.
- 59. Heat Control Switch Connections.
- 60. St. George Ranges. "Constallation" & "Supermatic" Models.

- Item No. 61. Westinghouse Ranges.
Models C326, C327, C355, C357.
62. Davell Ranges.
Models C6 - 2, C6 -3.
63. Roden Range.
Model 44.
64. U.M.I. "Exeter" Ranges.
Upright Cabinet, 2 Hotplate.
Elevated 3 Hotplate.
65. Metters Range.
Model L31.
66. Metters Ranges.
Models L76, E76.
67. B.G.E. Range.
Model DCA543.
- 67(A). Thermostat Control Fitted to 1967 Model
B.G.E. Ranges.
68. Metters Range.
Model 7 - 4 Hotplate.
69. English Electric Ranges.
Models 2030, 2031.
70. Parnall Ranges, EC8B, EC9G.
71. Frigidaire Ranges.
72. Satchwell Superswitch.
73. Davell 58 Duomatic Range.
74. U.M.I. "Enfield" Upright Cabinet Model
3 Hotplate.
75. Parnall E16 Upright Cabinet.
76. B.G.E. D.C.A. 583 "Space Chief" Upright
Cabinet 3 Hotplate.
77. Westinghouse C329 3 Hotplate Upright.

- Item No. 78. Westinghouse C333/1 3 Hotplate Upright.
79. St. George Rotomaster Upright Cabinet Model 4 Hotplate.
80. U.M.I. "Eton" Upright Cabinet Model 3 Hotplate.
81. A.E.I. "Hotpoint" RF3GA "Deluxe" Upright 3 Hotplate.
82. Simpson "Tappan" Ambassador E24 Model Upright 3 Hotplate.
83. St. George Bench Top Surface Units F.C.B.
84. Roden Electric Ranges "66" & "45" Upright Cabinet Models.
85. Simpson "Tappan" E27 Model "Fabulous 400".
86. Continental Auto - 4 Cabinet Type Range.
87. Everhot "Vermont" E8S Upright 3 Hotplate, Minute Minder and Everhot "Montclair" E9A Wall Mounted or Bench Top Unit, 3 Hotplate, Automatic.
88. Everhot "Brookwood".
89. Everhot Upright and Eye Level Ranges.
90. New World ER42/1, ER43/1 Upright and ER44/1 Elevated Ranges.
91. Malleys "Whirlpool" Chancellor Elevated Ranges. Models Nos. CE861AR, CE860T, CE860TR.
92. Chef "Consul" Upright Range.
93. Westinghouse P.A.G. Upright Ranges.
94. Malleys Whirlpool "Chancellor" Elevated Ranges. Models Nos. CE53/7, CE54/7, CE55/7.
95. Malleys Whirlpool "Premier" and "Statesman" Upright Ranges.
96. Simpson "Belmont" and "Ambassador" Ranges.
97. Metters LD2 Upright and ED1, ED2 Elevated Ranges.
98. G.E.C. "Mastermatic" Range (Thermostatic Hotplate Control).
99. Wiring Diagram - Montclair Model E9A.

SECTION NO. 2SERVICE TO ELECTRIC RANGESITEM NO. 1 - GENERAL

Electric Ranges at customers' premises shall be serviced by the Appliance Repair Section of the Electricity Development Branch subject to the conditions outlined in Section No. 1 of this Handbook.

ITEM NO. 2 - HANDLING OF REQUESTS FOR SERVICE TO ELECTRIC RANGES

- (i) All requests for service to electric ranges will be handled by Telephonists rostered in the Emergency Service Room. A service request card will be prepared setting out full details of the customer's request and an appointment made for a visit by an Electricity Development Branch Technician in accordance with the information displayed on the Appliance Repairs Section Appointment board.

The card will be marked to show that it is an appliance repairs job and during normal working hours forwarded via the card conveyor to the Appliance Repairs Despatch room.

- (ii) Outside the hours when the Appliance Repairs staff are working, consideration should be given to whether the nature of the request for service is such that an Emergency Service Officer could render assistance and whether this action is warranted by the urgency of the customer's need, and if so the card should be forwarded to the Emergency Service Despatch Officer for attention.
- (iii) If the above action is not required, the Service Request card is held in a post-dated file for action by the Appliance Repairs staff in accordance with the appointment time arranged.

ITEM NO. 3 - ACTION TO BE TAKEN BY OFFICERS ATTENDING ELECTRIC RANGES AT CUSTOMERS' PREMISES

- (i) Officers of the System Operation Branch when attending electric ranges at customers' premises will repair defective wiring of terminals or contacts in a permanent manner if possible; if not possible, temporary repairs should be effected.
- (ii) Should repairs not be possible the defective part will be disconnected and the remainder of the range left in a condition to operate.

(Over)

ITEM NO. 3 (CONT'D)

- (iii) When it is not possible to effect permanent repairs, the job shall be coded for attention by the Appliance Repair section two working days later during the hours in which the Appliance Repairs Technicians are working, unless the customer wishes to make other arrangements.
- (iv) In cases of extreme urgency and where the customer is prepared to pay overtime charges if applicable, a message shall be conveyed by the Emergency Service Officer to the Radio Telephonist for passing to the Despatch Officer-Co-ordination who will arrange for the job to be referred to the Appliance Repairs Despatch, if working, or organise the calling out of an Electricity Development Branch Technician where necessary.

ITEM NO. 4 - SHOCKS FROM ELECTRIC RANGES

- (i) When reports of shocks from electric ranges are received, a Service Request card must be prepared and arrangements made for an Emergency Service Officer to visit the premises concerned.
- (ii) The officer investigating the reported electric shock shall take action as is set out in Branch Standing Instruction No. 3110. (See Section No. 14 in this Handbook).
- (iii) When an officer is able to ascertain the cause of shocks from electric ranges and finds that only a section of the range is defective, he shall disconnect the defective section by withdrawing the fuse controlling it and attach the fuse and a "Defective Apparatus" label (N.C.1190) to the switch controlling the defective section.
- (iv) The customer shall be informed that, if required, an officer of The Sydney County Council will attend to rectify the defect. The job shall be coded for possible further attention by the Electricity Development Branch.

ITEM NO. 5 - DISCONNECTION OF ELECTRIC RANGES1. Handling of Requests for Disconnection

- (i) Customers who request the disconnection of electric ranges installed in premises they are vacating should be advised to obtain the services of an Electrical Contractor.

Note: The Sydney County Council in selling ranges, hot water systems and other permanently wired and fixed appliances, sells the items on Extended Credit, not Hire Purchase. Once the customer has signed the contract to purchase, the item becomes the property of the purchaser, to do with as they please.

ITEM NO. 5 (CONT'D)

- (ii) Customers who require an electric range to be disconnected and reconnected when laying new floor coverings shall be advised to telephone for service. These jobs are carried out by the Appliance Repairs section during normal working hours and a charge is made for this work.

Occasionally such jobs are done by Emergency Service Officers outside normal working hours to suit customers convenience. The same charges are made and are raised by the Electricity Development Branch as a matter of convenience.

ITEM NO. 6 - EMERGENCY SERVICE TO BUILT-IN RANGES AND RANGES
BUILT ON PLATFORMSa. Built-In Ranges

- (i) Emergency Service Officers are not expected to remove cover strips, mouldings, etc. when providing emergency service to built-in ranges. Where removal of fitments is necessary, the customer will be requested to arrange for this to be done and an appointment made for a visit by an Electricity Development Branch Technician.
- (ii) If assistance is necessary to lift out the range from a difficult location, the customer will be asked to provide the required assistance. If the customer is unable to assist, a radio message shall be made to arrange for an additional Emergency Service Officer to attend.

b. Ranges Built on Platforms

The following procedure will serve as a guide to an officer required to remove a range which is built on a platform:-

1. Ranges Wired in Rigid Conduit

- (i) Remove the fuse elements at the switchboard protecting the range circuit.
- (ii) Disconnect the range wiring from the main terminal block. (Refer to the appropriate illustration in the Emergency Service Officers' Handbook for the location of the main terminal block).
- (iii) Detach the rigid conduit from the range.
- (iv) Slide the range forward over the edge of the platform and suitably support the front end. (This may require the placing of battens between the base of the range and the platform, and the supporting of the front ends of the battens with a wooden case or chair).

- (v) Proceed to service the range, and restore it to its original position on the platform, and reconnect the wiring in the rigid conduit.
- (vi) Restore the fuse elements at the switchboard.

2. Ranges Wired in Flexible Conduit

Determine whether the top rear section of the platform is cut away and the flexible conduit is of sufficient length to permit the range to be moved forward freely without fouling the conduit. If these conditions exist, disconnection of the wiring to the range will not be necessary. The range may be moved forward and supported in the same manner as that described for ranges wired in rigid conduit.

If the range is wired in flexible conduit, but the top rear section of the platform is not suitably cut away, or the flexible conduit is not of sufficient length to permit free movement of the range, proceed as for Ranges Wired in Rigid Conduit.

3. Work on Ranges Likely to be Time Consuming

When an Emergency Service Officer meets with these conditions and it is evident that considerable time will be involved gaining access to investigate, these jobs should be referred to the Electricity Development Branch.

If urgent service is necessary after normal working hours, weekends and public holidays, every endeavour shall be made to restore supply in whole or part, within the limits of Emergency Service.

ITEM NO. 8 BELLING TYPE 47, 3 HOTPLATE RANGE.

1. Manufacturer.

The Belling Type 47, 3-hotplate range is manufactured by Belling & Co. Ltd., London, England, and is distributed in Sydney by W.G. Watson & Co. Pty. Ltd.

Ranges of this type commenced to be connected to the Council's supply in February, 1948.

2. Location of Fuses

Fuses are located behind the right hand side panel. To renew a fuse, detach right hand side panel.

3. Removal of Right Hand Side Panel.

It is necessary to remove the side panel for connection or disconnection of range, replacement of cut-outs, 3-heat switches, female sockets and terminal blocks of 1800 W. and 1000 W. hotplates.

To remove the side panel, unscrew two $\frac{1}{2}$ " x $\frac{3}{16}$ " N.P. countersunk head screws located on back edge of panel.

4. Lifting of Hob.

The hob is hinged at the rear. To raise it:-

- (a) Detach splash back by lifting it from the locating holes in the rear of the hob.
- (b) Open warming oven door.
- (c) Turn, anti-clockwise, the special $\frac{1}{4}$ " rod with a right angle set situated under the front of the hob.
- (d) Raise the hob to its fullest extent allowable by the quadrant at the left hand side.

5. 1800 W. or 1000 W. Cast Hotplates.

These hotplates are of the plug-in type using four $\frac{1}{4}$ " brass contact pins.

To remove a cast hotplate:-

- (a) Lift the hob.
- (b) Firmly grip the front edge of the hotplate and the back section of cast aluminium cradle and lift upwards.

ITEM NO.8 (CONT'D).

6. 2000W. Grill Boiler Hotplate.

This hotplate is of the plug-in type using four $\frac{1}{4}$ " brass contact pins.

To remove a griller-boiler :-

- (a) Lift the hob.
- (b) Firmly grip the front and back edges of casting and lift upwards.

7. Side and Bottom Oven Elements.

The oven is heated by three oven elements, one element being located on each side of the oven interior and one on the bottom.

Each element assembly consists of two resistors, and the total loading of each side oven element is 960 watts, whilst the bottom element is 580 watts. The loading is different on each resistor of the side oven element. The outer resistor is 360 watts and the inside resistor 600 watts. The two resistors on the bottom oven element also differ, the outside resistor being 220 watts and the inside resistor 360 watts.

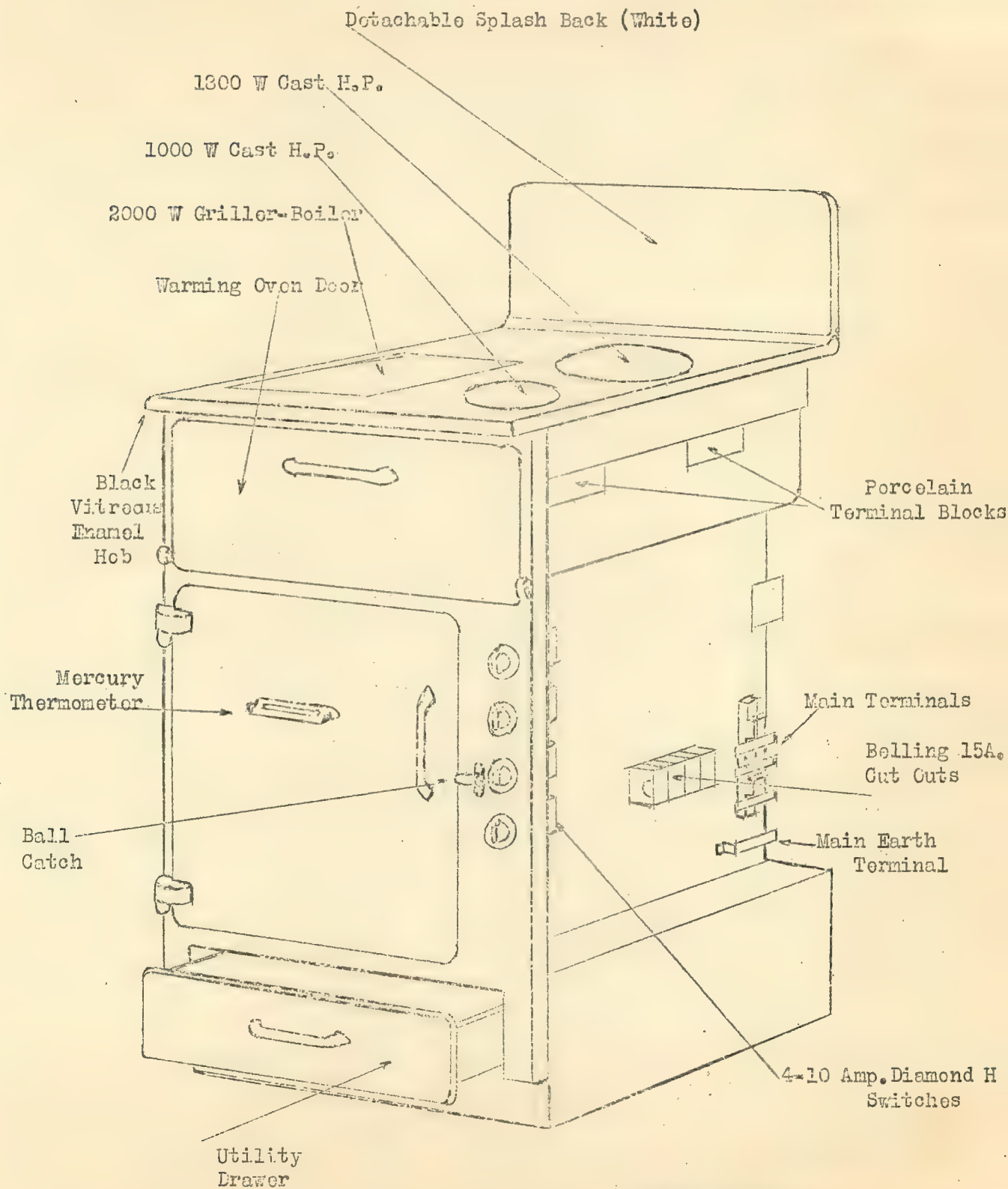
The element assemblies are stamped "SIDE" and "BOTTOM" on the metal bracket securing the porcelain terminal block. As the side and bottom elements possess different wattages and are interchangeable care should be exercised to replace the elements in their correct positions.

The side and bottom oven elements are of the plug-in type using four $\frac{1}{4}$ " brass contact pins.

To remove a side or bottom oven element:-

- (a) Remove oven slides and baking dish.
- (b) Unfasten two metal clips securing removable oven interior to main front casting.
- (c) Unscrew two $\frac{3}{8}$ " x $\frac{5}{32}$ " RD/HD N.P. screws securing oven vent to removable oven interior.
- (d) Detach oven interior by sliding forward.
- (e) Firmly grip each side of the oven assembly and slide forward to disengage the slotted section in the front centre of the assembly frame from the nickel plated cheese headed stud located on the side or bottom of the oven interior.

APPARATUS SERVICE INSTRUCTION NO. 64.



BELLING RANGE.

Type 47

RATING 7.3 kW

ITEM NO.9 "BRIDGEBUILT" UTILITY 2-HOTPLATE RANGE.

1. Manufacturer.

Since February, 1949, Dominion Factors Pty. Ltd., Sydney, have supplied the Council with Utility Model "Bridgebuilt" ranges produced in the factory of John C.W. Bridge & Co.(Newcastle) Pty. Ltd., Newcastle, New South Wales.

2. Location of Fuses.

The 10 amp. "Federal" fuses are located below the hob.

3. Removal of Hob and Splash Back.

The hob, with a turned down edge of 1-7/16" loosely fits over the top of the range.

To remove the hob, firmly grip the two sides of the hob and lift upwards.

The splash back may be removed if necessary by unscrewing two $\frac{1}{2}$ " x $\frac{1}{4}$ " countersunk head screws and nuts.

4. Removal of Right Hand Side Panel.

It is necessary to remove the side panel for replacement of "Simmerstat", "OGDEN" 20 amp. single-pole 3-heat switch, oven thermostats, single-pole flush switch and pilot lamp.

To remove the side panel:-

- (a) Remove hob and splash back.
- (b) Detach back panel (do not disconnect range wiring)
- (c) Remove metal cover protecting terminal strip on 1800 watt hotplate from side panel.
- (d) Unscrew $\frac{1}{2}$ " x $\frac{3}{16}$ " RD/HD screw located in top front edge of side panel.
- (e) Remove side panel by detaching at the three elongated holes in the front edge from three $\frac{3}{16}$ " RD/HD screws, located in the back edge of the switch panel.

5. Removal of Metal Cover from Main Terminal Block.

The metal cover protecting the main terminal block is located under the hob at the rear right hand top of the range.

6. Bottom Oven Element.

The oven is heated by a 2400 watt bottom oven element consisting of two 1200 watt resistors.

No top oven element is fitted.

6. Bottom Oven Element (Cont'd).

The element is controlled by a "SATCHWELL" type C.S. 15 amp. thermostat and 10 amp. single-pole flush switch. (Diagram attached).

To preheat the oven, turn the oven thermostat to the desired temperature setting and the single-pole flush switch to the "PREHEAT" position. The two resistors are then connected in parallel, and the pilot lamp located below the thermostat control knob will provide the full glow.

When the oven reaches the predetermined temperature the thermostat switch contacts open, the two resistors are disconnected and pilot lamp ceases to glow.

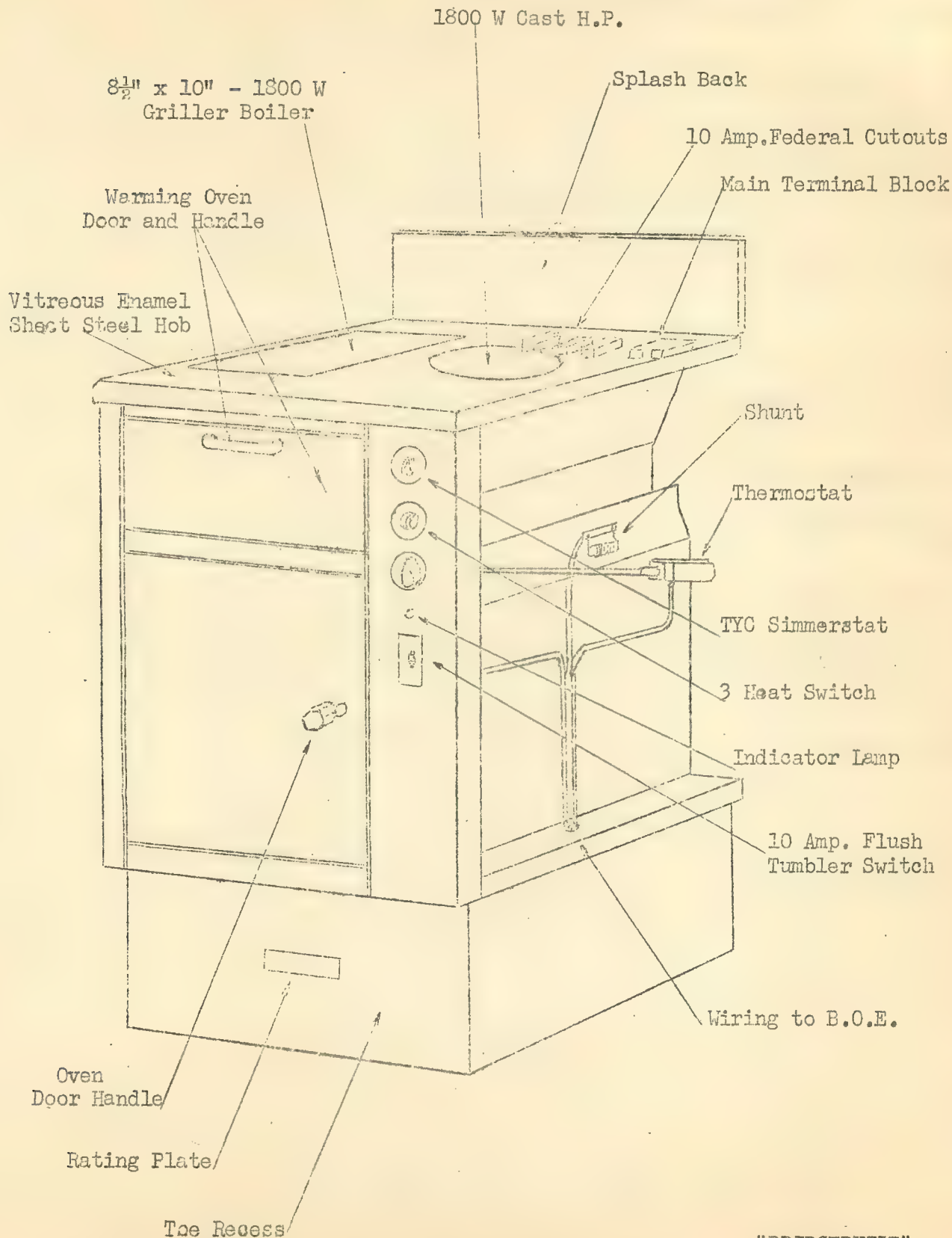
The flush switch should then be switched "OFF" to the "BAKE" position. When the temperature of the oven drops below the knob setting, the thermostat places one resistor in circuit and the pilot lamp will provide a dim glow on half voltage.

The thermostat will "cycle" to maintain a constant oven temperature.

The bottom oven element is of the plug-in type using four $\frac{1}{4}$ " cadmium plated pins.

To remove the bottom oven element :-

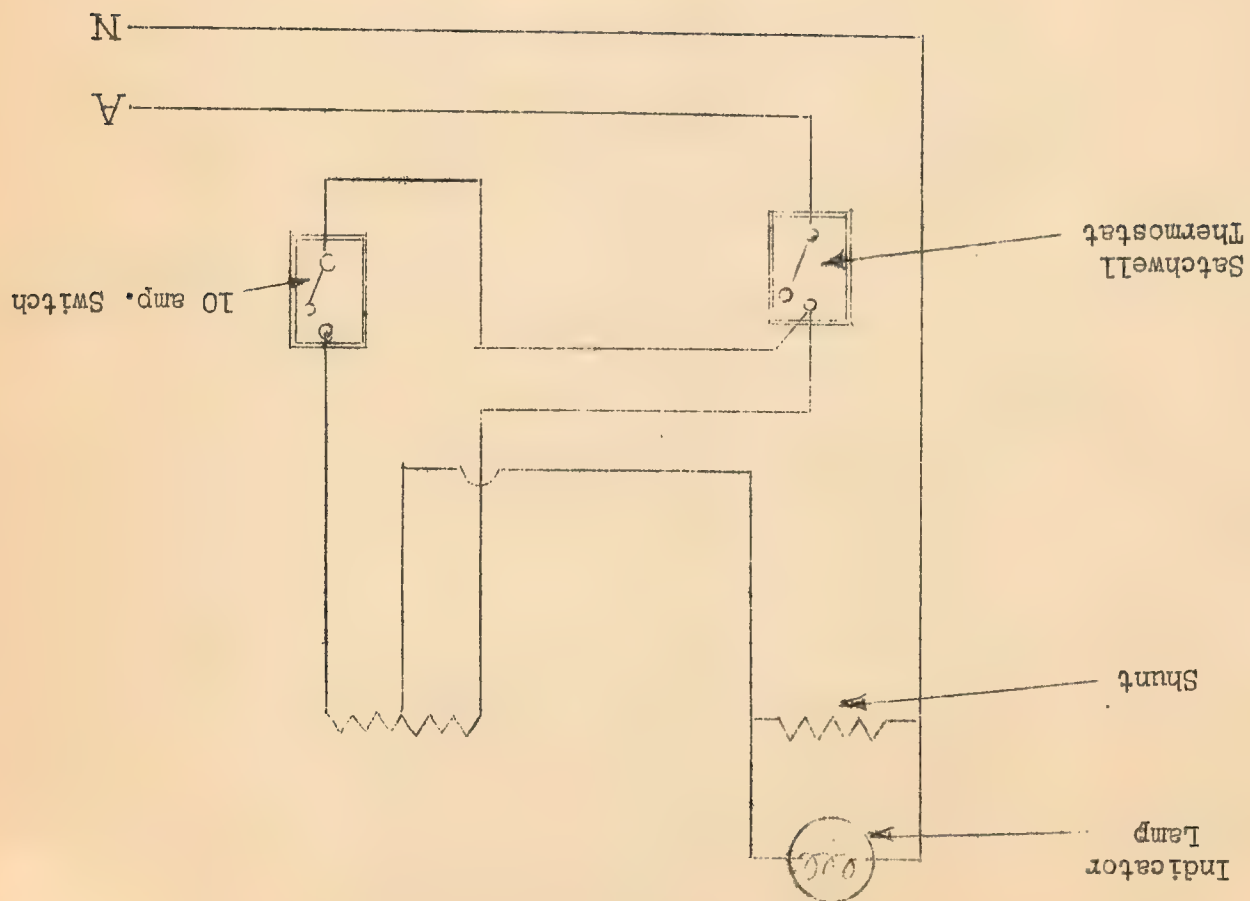
- (a) Firmly grip each side at front of element assembly and pull upwards to part the contact pins from the female sockets.
- (b) Detach the element assembly by pulling forward.



Vent at centre top of back panel of oven interior.

"BRIDGEBUILT"
UTILITY RANGE.

APPENDIX "B".



ITEM NO.10 - "BRIDGEBUILT" SENIOR 3-HOTPLATE RANGE.

1. Location of Fuses.

The 10 amp. Federal fuses are located below the hob.

2. Removal of Hob and Splash Back.

It is necessary to remove the hob and splash back for connection or disconnection of the range, replacement of switches, Simmerstat, fuses, hotplates and wiring to top and bottom oven elements.

The hob is hinged at the back. To remove it:-

- (a) Detach splash back by lifting it from locating brackets screwed to the rear of the range.
- (b) Raise the hob sufficiently to clear the three hotplates, and slide to the right until the two hinged sections screwed to the hob disengage from the two pins forming part of the hinges screwed to the rear of the range.

3. Removal of Metal Cover from Main Terminal Block.

The metal cover protecting the main terminal block is located under the hob at the rear right hand top of the range.

To remove the cover:-

- (a) Isolate the main range circuits.
- (b) Remove splash back and hob.
- (c) Remove the 5 fuses.
- (d) Unscrew the $\frac{1}{2}$ " x $\frac{3}{16}$ " countersunk head brass screw.
- (e) Detach the cover.

4. Removal of 1000 W. Cast Hotplate.

To remove 1000 watt cast hotplate:-

- (a) Remove splash back and hob.
- (b) Unscrew two $1\frac{1}{2}$ " x $\frac{3}{16}$ " stove screws and remove metal cover from wiring channel.
- (c) Disconnect the beaded leads at the terminals of the connector.
- (d) Lift out the hotplate from the earth socket.

5. Removal of 1800 W. Cast Hotplate.

To remove 1800 W. cast hotplate:-

- (a) Isolate the main range circuits.
- (b) Remove splash back and hob.

ITEM NO.10 (CONT'D).Bridgebuilt 3-Hotplate
Range.

- (c) Detach metal cover from top of switches and Simmerstat by unscrewing three No.7 x 3/8" self-tapping screws.
- (d) Disconnect the beaded leads at the terminals of the 3-heat switches (Use angle screw driver).
- (e) Lift out the hotplate from the earth socket.

6. Removal of Top Oven Element.

The top oven element is of the plug-in type using four (4) $\frac{1}{4}$ " cadmium plated pins.

To remove the top oven element:-

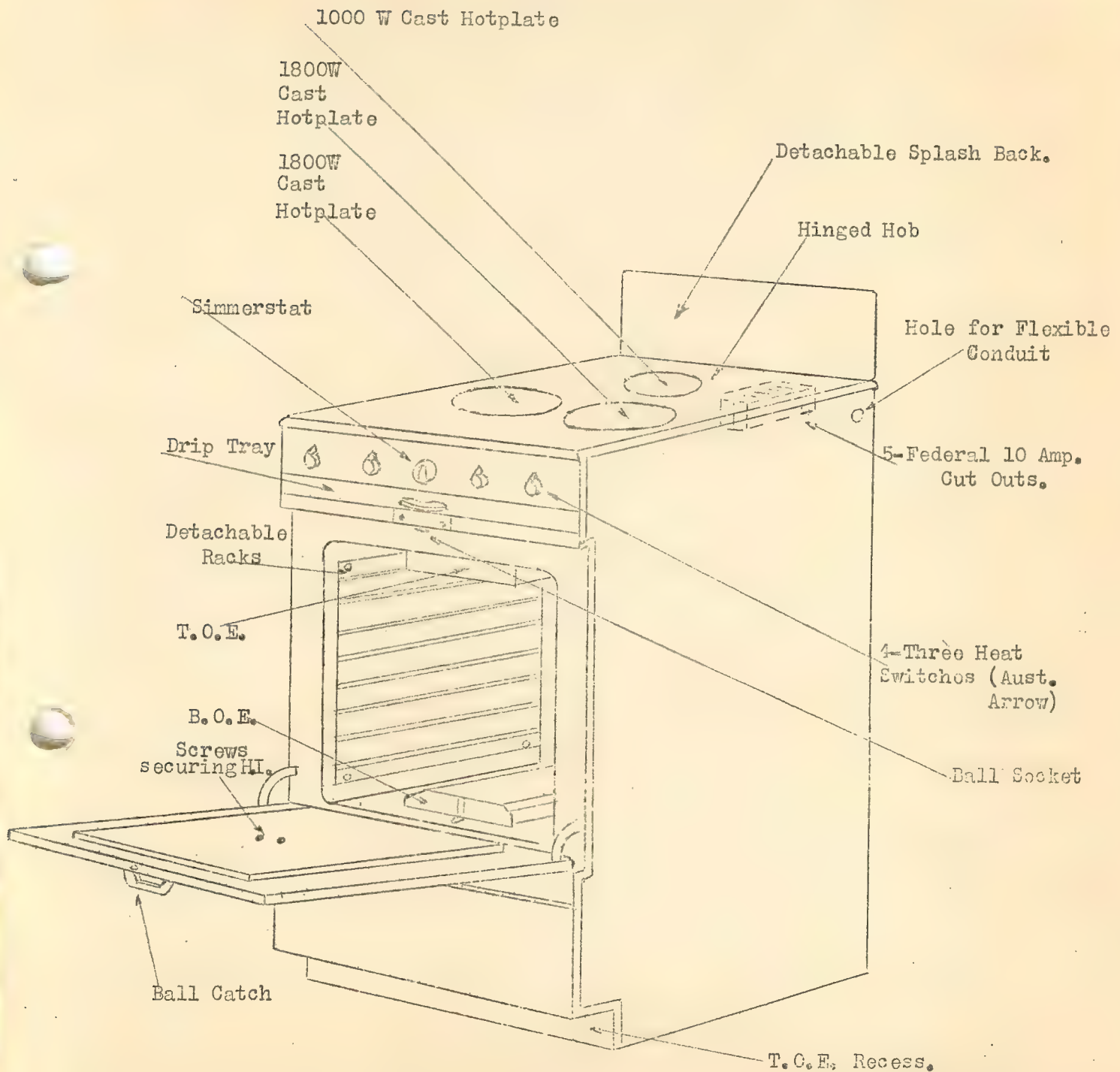
- (a) Unscrew the No.7 x 3/8" self-tapping screw securing metal clip (located on front of element assembly) to top of oven interior.
- (b) Firmly grip each side at front of element assembly, and pull downwards to part the contact pins from the female sockets.
- (c) Pull element assembly forward until back edge disengages from the metal bracket screwed to the rear top of oven interior.

7. Removal of Bottom Oven Element.

The bottom oven element is of the plug-in type using four (4) $\frac{1}{4}$ " cadmium plated pins.

To remove the bottom oven element:-

- (a) Unscrew the No.7 x 3/8" self-tapping screw securing metal clip (located on front of element assembly) to bottom of oven interior.
- (b) Firmly grip each side at front of element assembly and pull upwards to part the contact pins from the female sockets.
- (c) Pull assembly forward until back edge disengages from the metal bracket screwed to the rear bottom of oven interior.



ITEM NO.10 - "BRIDGEBUILT" SENIOR 3-HOTPLATE RANGE.

1. Location of Fuses.

The 10 amp. Federal fuses are located below the hob.

2. Removal of Hob and Splash Back.

It is necessary to remove the hob and splash back for connection or disconnection of the range, replacement of switches, Simmerstat, fuses, hotplates and wiring to top and bottom oven elements.

The hob is hinged at the back. To remove it:-

- (a) Detach splash back by lifting it from locating brackets screwed to the rear of the range.
- (b) Raise the hob sufficiently to clear the three hotplates, and slide to the right until the two hinged sections screwed to the hob disengage from the two pins forming part of the hinges screwed to the rear of the range.

3. Removal of Metal Cover from Main Terminal Block.

The metal cover protecting the main terminal block is located under the hob at the rear right hand top of the range.

To remove the cover:-

- (a) Isolate the main range circuits.
- (b) Remove splash back and hob.
- (c) Remove the 5 fuses.
- (d) Unscrew the $\frac{1}{2}$ " x $\frac{3}{16}$ " countersunk head brass screw.
- (e) Detach the cover.

4. Removal of 1000 W. Cast Hotplate.

To remove 1000 watt cast hotplate:-

- (a) Remove splash back and hob.
- (b) Unscrew two $1\frac{1}{2}$ " x $\frac{3}{16}$ " stove screws and remove metal cover from wiring channel.
- (c) Disconnect the beaded leads at the terminals of the connector.
- (d) Lift out the hotplate from the earth socket.

5. Removal of 1800 W. Cast Hotplate.

To remove 1800 W. cast hotplate:-

- (a) Isolate the main range circuits.
- (b) Remove splash back and hob.

ITEM NO. 11. "ELECTRICE" TYPE 2-L 2-HOTPLATE RANGE.

1. Manufacturer.

Since November 1948, New System Telephones Pty.Ltd., Sydney, have supplied the Council with type 2-L ranges produced in the factory of the Electricity Meter Manufacturing Co.Pty.Ltd., Orange, New South Wales.

2. Layout of Component Parts.

The layout of hotplates, fuses, switches etc. is shown in Appendix "A" attached.

3. Location of Rating Plate.

The rating plate is located on the front left hand corner of the toe recess.

4. Location of Fuses.

The "Pyrex" fuses are located below the hob at the front of the range.

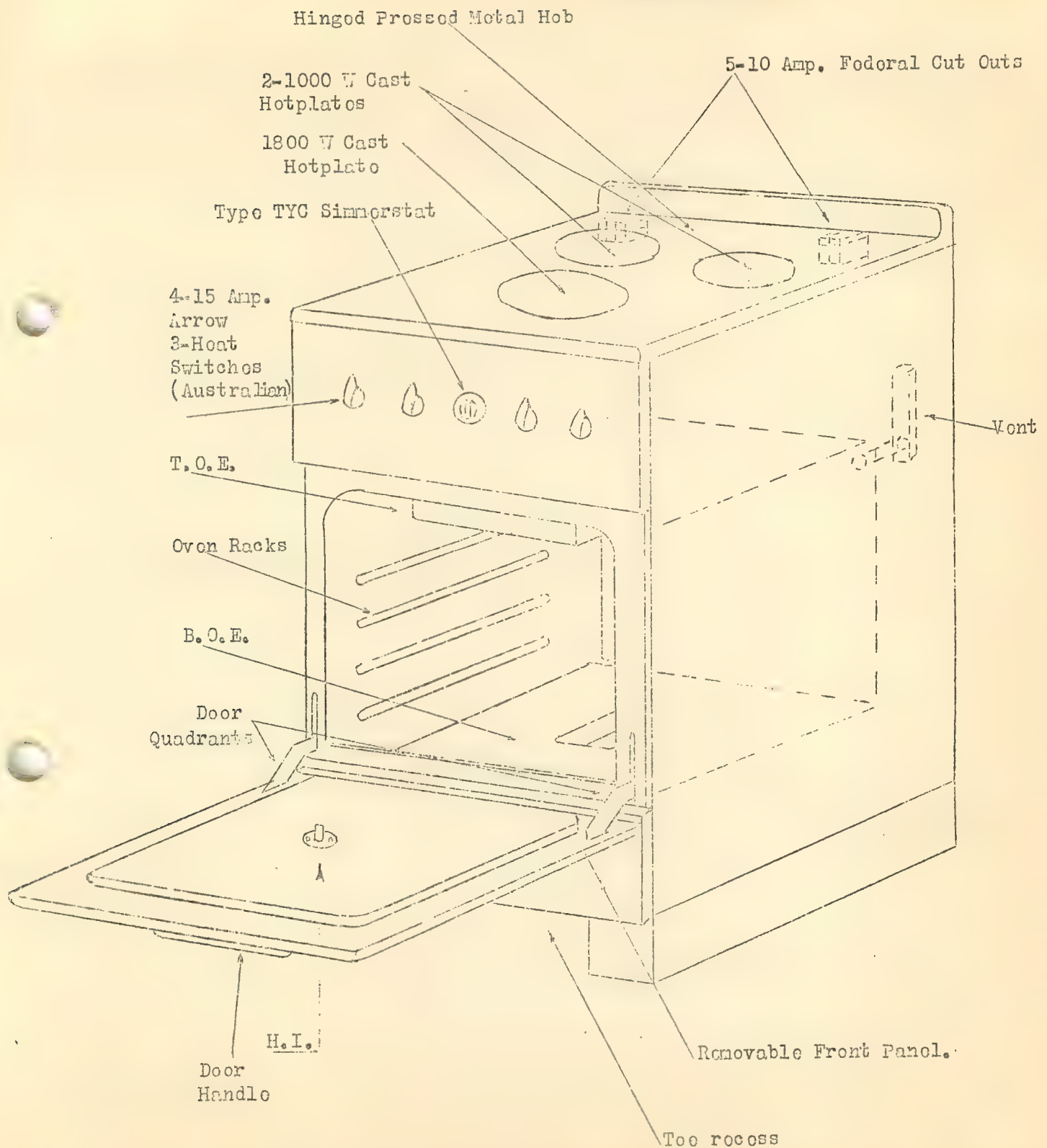
5. Removal of Cast Hotplates.

The 2-L type range is fitted with one 1800 W. and one 6 $\frac{1}{4}$ " 600 W. cast hotplates, whereas the 3-L type is fitted with one 8" 1800 W. and two 6 $\frac{1}{4}$ " 1000 W. cast hotplates. The procedure for removing cast hotplates is detailed in paragraph 8 of Item No.12.

6. Wiring.

The range wiring is of 1/.064" International Radio or "Rockbestos" covered wire and is readily accessible for inspection, testing or replacement after removing the front panel, hob and top and bottom sections of the back panel.

APPENDIX "A".



Rating Plate located on
L.H.S. of toe recess.

"ELECTRICE" RANGE.

1944

1944

ITEM NO.13 - "ETNELEC" 3-PLATE RANGES.

1. Manufacturer.

"Etnelec" ranges were manufactured by Etna Electrical Appliances Co. Pty. Ltd. Flemington, N.S.W. - now out of business.

2. Description.

There are two models - the 3-Plate Cabinet Model and the 3-Plate Elevated Oven Model. This Item will deal with the construction of the Cabinet Model but the details may be used as a guide to the location of component parts, etc. of the Elevated Oven Model.

Attention is drawn to the addition of a nickel-plated spillage channel on the Elevated Oven Model, located at the right hand side of the hob and fixed to the side of the oven by No.7 self-tapping screws. This spillage channel must also be removed before lifting the hob.

3. Location of Fuses.

The 15 amp. wedge-type fuses are located behind the drip tray (panel marked "FUSES") at front of range.

4. Lifting of Hob and Splash Back.

The splash back is attached to the hob.

To remove the hob and splash back -

- (a) Remove screw in top centre of hob. (Not fitted in early stages of manufacture).
- (b) Unscrew one No.7 self-tapping screw located at each front corner under hob.
- (c) Firmly grip the two sides of hob and lift upwards.

5. Hotplates.

The hotplates comprise two 8" diam. 1800 watt and one 6" diam. 1000 watt.

Each hotplate is held in position by the earth pin in centre of hotplate fitted to a plug-in type base.

The element leads are connected to a terminal block on the hotplate assembly.

To remove a hotplate:-

- (a) Firmly grip each side of hotplate and raise from the plug-in base.
- (b) Disconnect the asbestos covered conductors from the hotplate terminals.

Etnelec 3-Plate Range.

2.

ITEM NO.13 (CONT'D).

6. Top Oven Element.

The top oven element is of the plug-in type using three contact pins and an earth pin.

The loading is 2100 watts.

To remove the top oven element:-

- (a) Unscrew two No.7 self-tapping screws at front corners of oven element assembly.
- (b) Firmly grip each side of oven element assembly and slide forward.

7. Bottom Oven Element.

The bottom oven element is of the plug-in type using three contact pins and an earth pin.

The loading is 1400 watts.

To remove the bottom oven element:-

- (a) Remove side racks by lifting from clips located at top of oven interior.
- (b) Unscrew two No.7 self-tapping screws and withdraw false oven bottom.
- (c) Unscrew two No.7 self-tapping securing bottom oven element assembly.
- (d) Firmly grip each side of oven element assembly and slide forward.

The bottom oven element is controlled by an "Ogdon" 3-heat switch on some ranges and on other ranges a thermostat and pilot light is fitted.

The top and bottom oven elements are not interchangeable.

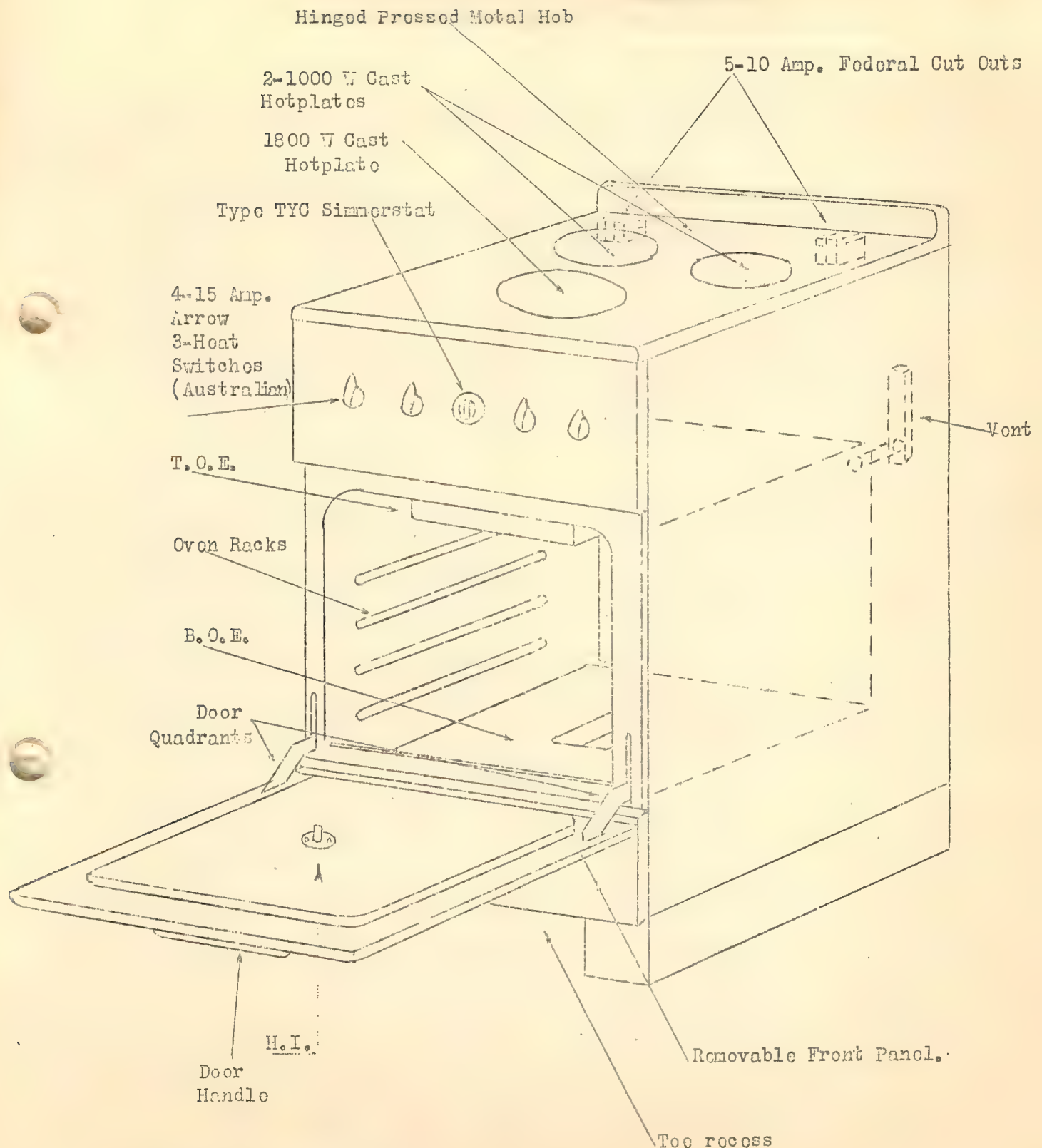
8. Oven Terminals.

The oven terminals are located behind back panel.

9. Wiring Terminals.

The range wiring terminals are located behind small plate (marked "TERMINALS") attached to back panel.

APPENDIX "A".



Rating Plate located on
L.H.S. of too recess.

"ELECTRICE" RANGE.

Etnelec 3-Plate Range.

2.

ITEM NO.13 (CONT'D).

6. Top Oven Element.

The top oven element is of the plug-in type using three contact pins and an earth pin.

The loading is 2100 watts.

To remove the top oven element:-

- (a) Unscrew two No.7 self-tapping screws at front corners of oven element assembly.
- (b) Firmly grip each side of oven element assembly and slide forward.

7. Bottom Oven Element.

The bottom oven element is of the plug-in type using three contact pins and an earth pin.

The loading is 1400 watts.

To remove the bottom oven element:-

- (a) Remove side racks by lifting from clips located at top of oven interior.
- (b) Unscrew two No.7 self-tapping screws and withdraw false oven bottom.
- (c) Unscrew two No.7 self-tapping securing bottom oven element assembly.
- (d) Firmly grip each side of oven element assembly and slide forward.

The bottom oven element is controlled by an "Ogden" 3-heat switch on some ranges and on other ranges a thermostat and pilot light is fitted.

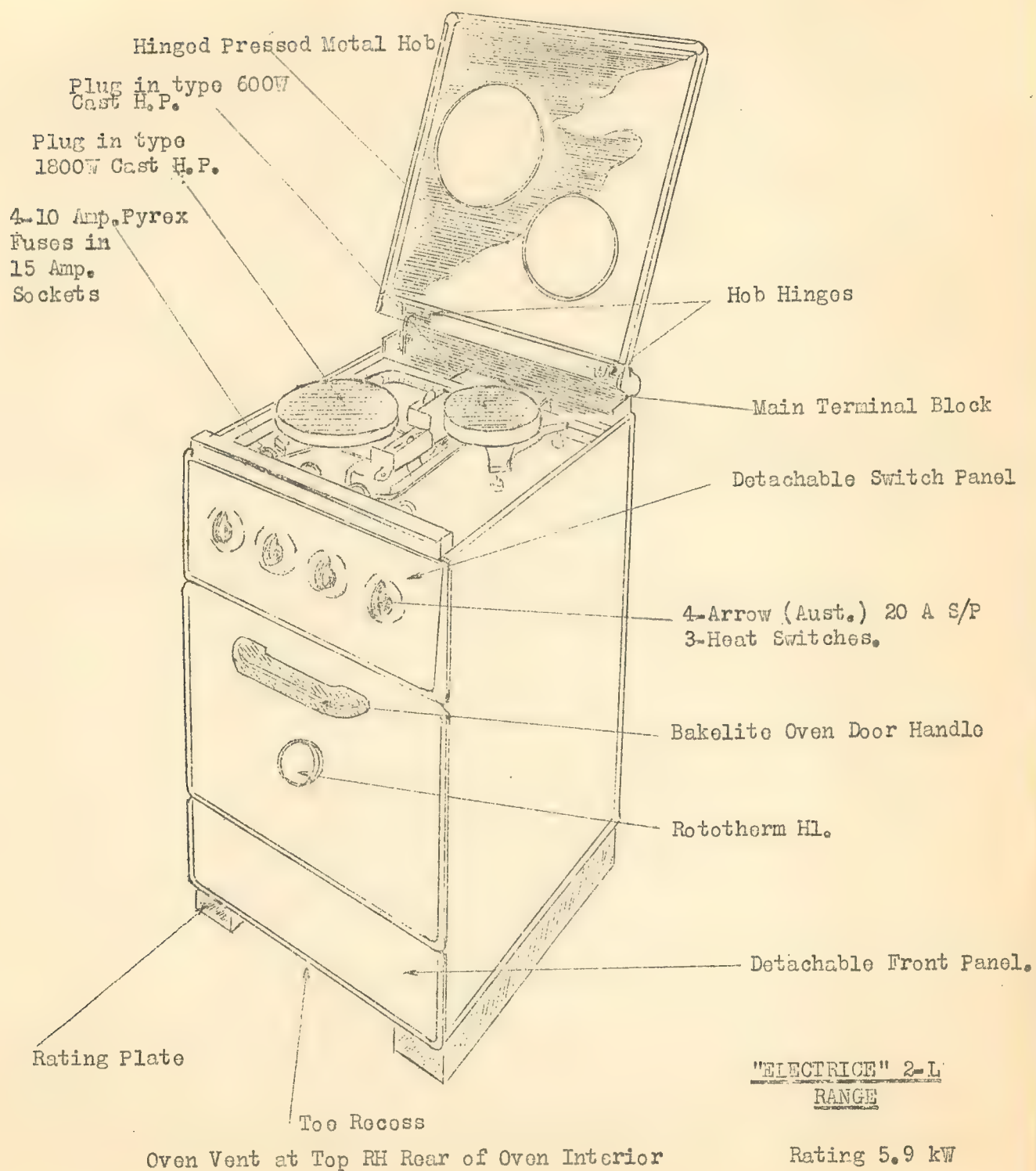
The top and bottom oven elements are not interchangeable.

8. Oven Terminals.

The oven terminals are located behind back panel.

9. Wiring Terminals.

The range wiring terminals are located behind small plate (marked "TERMINALS") attached to back panel.



ITEM NO.12 - ELECTRIC TYPE 3-L 3-HOTPLATE RANGE.

1. Location of Fuses.

The five 10 amp. Federal fuses are located below the splash back as shown in Appendix "A" and are accessible when the hob is lifted.

2. Lifting of Combined Hob and Splash Back.

The hob is hinged at the rear and may be raised by lifting it open to its fullest extent.

3. 1800 W. and 1000 W. Cast Hotplates.

These hotplates are of the plug-in type using four $\frac{1}{4}$ " brass contact pins. The earth strip is welded to the rim of the hotplate.

To remove a cast hotplate:-

- (a) Lift the hob.
- (b) Firmly grip each side of the hotplate and lift upwards.

4. Top Oven Element.

The top oven element is of the plug-in type using four $\frac{1}{4}$ " brass pins.

To remove the top oven element:-

- (a) Raise the front edge of the assembly to clear the turned up corners of the two slides which are spot welded to the oven interior.
- (b) Firmly grip the back edge of the element assembly and slide forward after disengaging the contact pins from the female sockets.

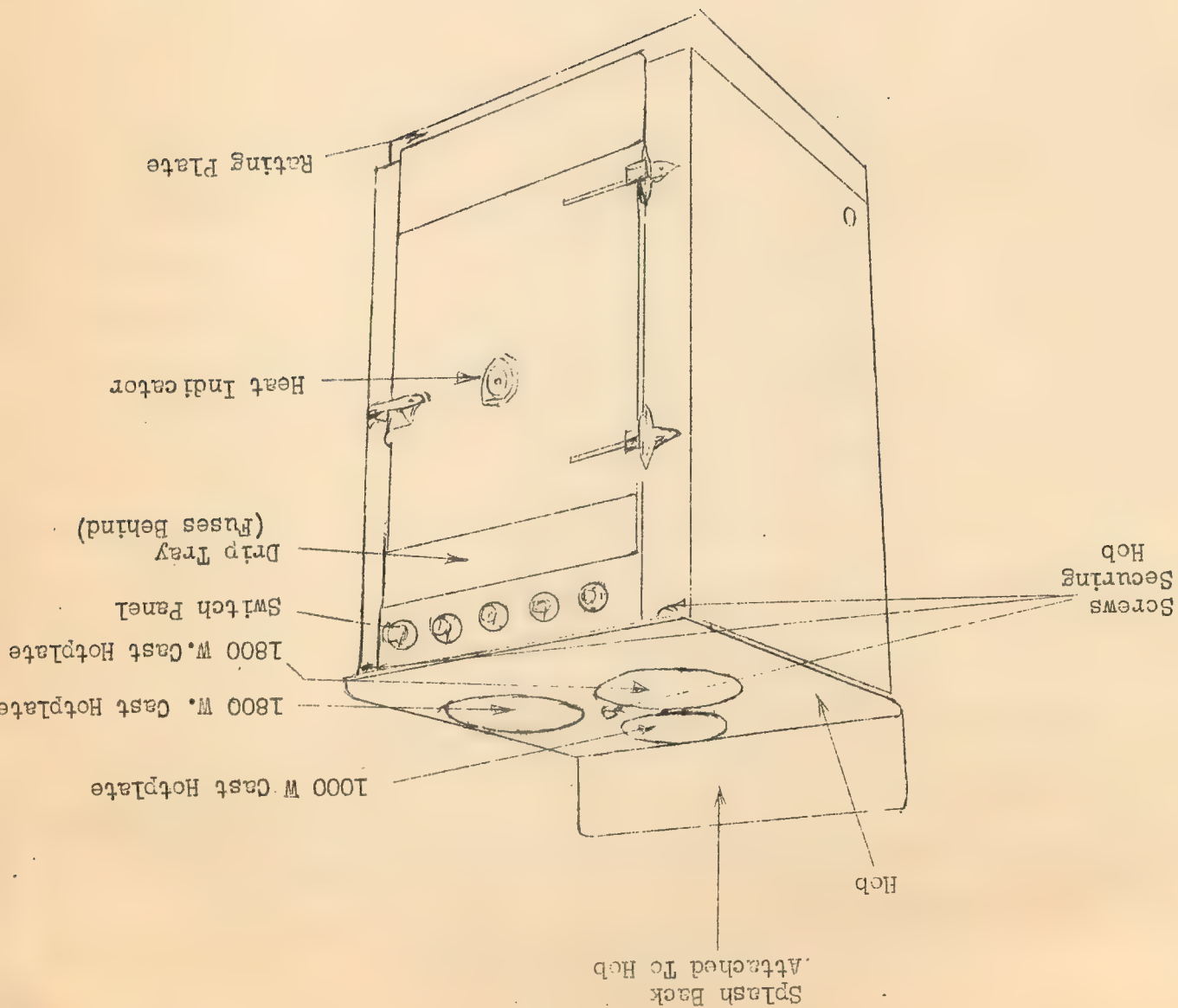
5. Bottom Oven Element.

The bottom oven element is of the plug-in type using four $\frac{1}{4}$ " brass contact pins.

To remove the bottom oven element, firmly grip each side of the oven assembly and slide forward to disengage the slotted section in the element frame from the vitreous enamelled cheese head stud located on the floor of the oven interior.

6. Wiring.

The range wiring is readily accessible after removing the front switch panel, hob, and top and bottom sections of the back panel.



ITEM NO.14 - "G.E.C." D.C. 334 AND D.C. 438 2-HOTPLATE RANGES.

1. Manufacturer.

The distributors of these ranges are the British General Electric Co. Pty. Ltd., Sydney.

2. Location of Fuses.

Fuses are located behind the small panel (marked "FUSES") which is detachable from the right hand side panel by unscrewing two $\frac{1}{2}$ " x 3/16" N.P. stove screws.

3. Lifting of Hob.

It is necessary to raise the hob to replace the hotplates.

The hob is hinged at the rear. To raise it:-

- (a) Detach the splash back by lifting it from the locating holes in the rear of the hob.
- (b) Open warming door.
- (c) Remove $\frac{1}{4}$ " hexagon nut and washer located under front edge of hob.
- (d) Raise hob by lifting it open to its fullest extent.

4. Removal of Right Side Panels.

The side panels are not interchangeable.

It is necessary to remove the right side panel for connection or disconnection of range, replacement of fuses, 3 and 4-heat switches, pilot lamp and replacement or adjustment of oven thermostat.

To remove the right side panel :-

- (a) Unscrew two 3/8" x 3/16" knurled head screws located on the back edge of the panel.
- (b) Detach the panel.

5. 1800 Watt Cast Hotplate.

This hotplate is of the plug-in type using four $\frac{1}{4}$ " brass pins.

6. 2000 Watt Grill-Boiler Hotplate.

The surface dimensions of this hotplate are 10" x 8". It is of the plug-in type using four $\frac{1}{4}$ " brass pins.

ITEM NO.14 (CONT'D).

7. Oven Elements.

The oven is heated by five 450 W. elements, two elements being located on each side of the oven interior and one on the bottom. Each element consists of a steatite former in which the nichrome resistor is fitted.

The five elements are connected in parallel to three $3/8" \times 3/32"$ cadmium plated copper busbars at the sides and bottom of the fixed oven interior with two $3/4" \times 3/16"$ CSK/HD cadmium plated screws, nuts and star washers. The three busbars pass through a steatite bushing located on the right hand side of the fixed oven interior.

Each element is held in position by a blue vitreous enamelled bracket spot welded to the front of the fixed oven interior and a $1\frac{3}{4}" \times \frac{1}{4}"$ stud secured with a $\frac{1}{4}"$ nut to the fixed oven interior at the rear of the steatite section of each oven assembly.

To remove an oven element:-

- (a) Remove baking dish and oven slides.
- (b) Detach removable oven interior by sliding forward.
- (c) Disconnect the element from the busbars by removing two $3/16"$ hexagon nuts and star washers.
- (d) Remove the $\frac{1}{4}"$ hexagon nut and washer from the stud located at the rear of the steatite assembly.
- (e) Lift the rear of the element assembly clear of the $\frac{1}{4}"$ stud and slide towards the rear of the range until the front section becomes detached from the blue vitreous enamelled bracket.

8. Wiring.

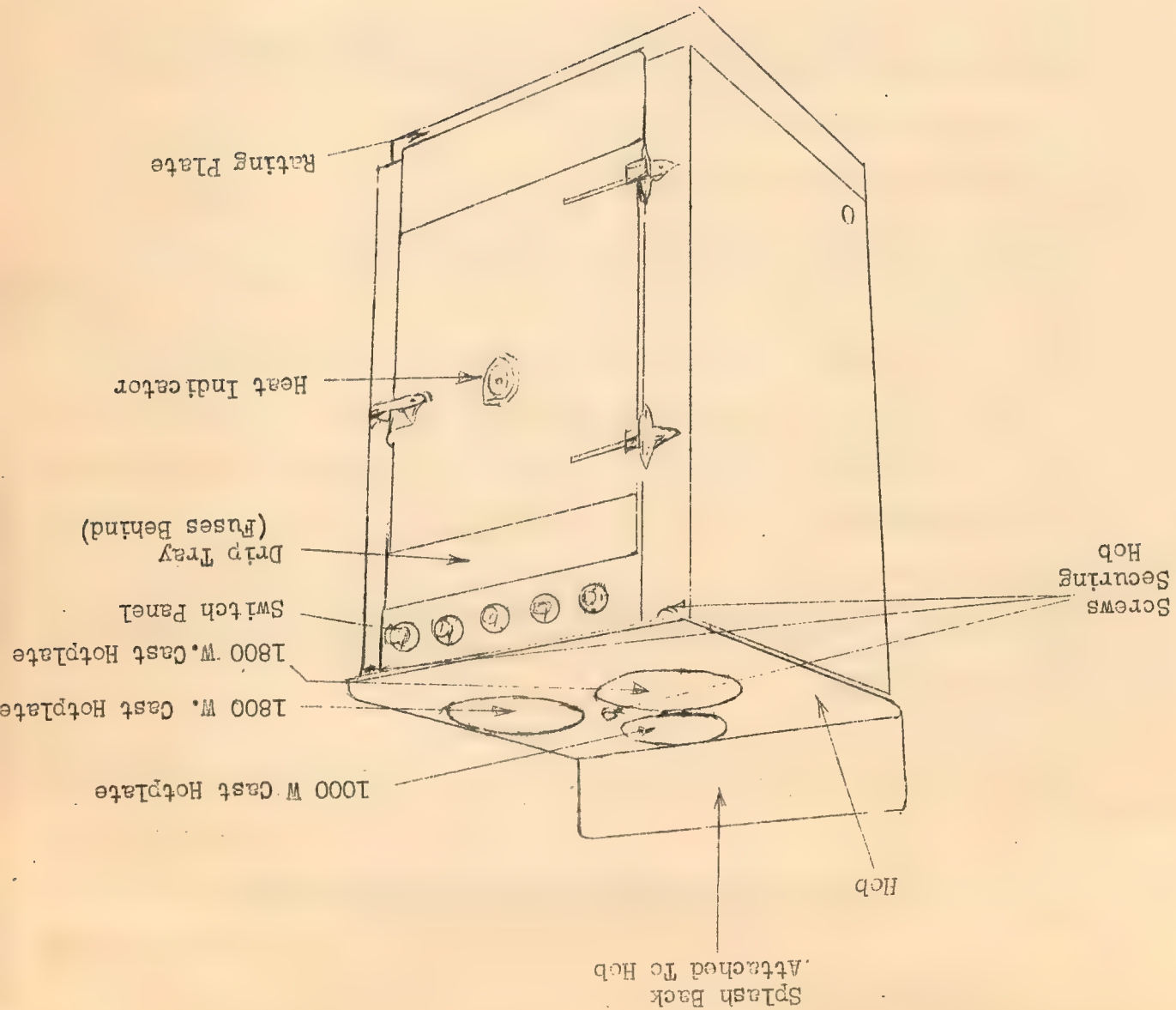
The wiring is accessible after removing the right side and top back panels.

9. Comparisons of Models D.C. 334 and D.C. 438 2-Hotplate Ranges.

The models D.C. 334 and D.C. 438 are similar in design and construction.

The oven elements are thermostatically controlled on the post-war model D.C. 438, whereas the oven elements are controlled by a 3-heat switch on the pre-war models D.C. 334 and D.C. 438.

On the models D.C. 334 and D.C. 438 where 3-heat oven control is used, the side and bottom oven elements are so arranged that when switched to "LOW" the two top side elements are connected in parallel and in series with the two lower side and the bottom elements which are also connected in parallel, and in series with the two lower side and the bottom elements which are also connected in parallel. When switched to "MEDIUM" the two lower side and bottom elements are connected in parallel. When switched to "HIGH", the five elements are connected in parallel.



ITEM NO.14 (CONT'D).

7. Oven Elements.

The oven is heated by five 450 W. elements, two elements being located on each side of the oven interior and one on the bottom. Each element consists of a steatite former in which the nichrome resistor is fitted.

The five elements are connected in parallel to three $3/8"$ x $3/32"$ cadmium plated copper busbars at the sides and bottom of the fixed oven interior with two $3/4"$ x $3/16"$ CSK/HD cadmium plated screws, nuts and star washers. The three busbars pass through a steatite bushing located on the right hand side of the fixed oven interior.

Each element is held in position by a blue vitreous enamelled bracket spot welded to the front of the fixed oven interior and a $1\frac{3}{4}"$ x $\frac{1}{4}"$ stud secured with a $\frac{1}{4}"$ nut to the fixed oven interior at the rear of the steatite section of each oven assembly.

To remove an oven element:-

- (a) Remove baking dish and oven slides.
- (b) Detach removable oven interior by sliding forward.
- (c) Disconnect the element from the busbars by removing two $3/16"$ hexagon nuts and star washers.
- (d) Remove the $\frac{1}{4}"$ hexagon nut and washer from the stud located at the rear of the steatite assembly.
- (e) Lift the rear of the element assembly clear of the $\frac{1}{4}"$ stud and slide towards the rear of the range until the front section becomes detached from the blue vitreous enamelled bracket.

8. Wiring.

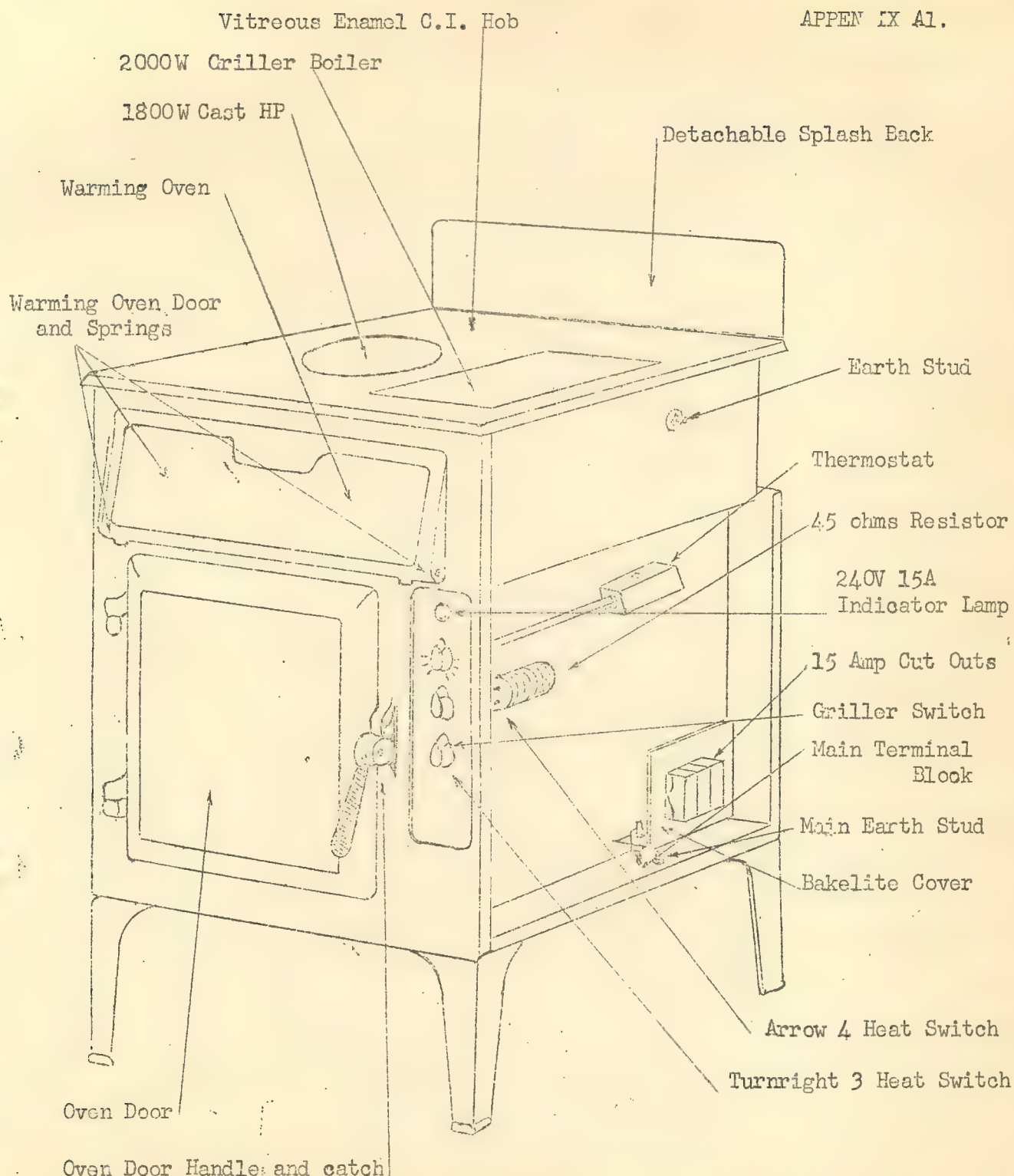
The wiring is accessible after removing the right side and top back panels.

9. Comparisons of Models D.C. 334 and D.C. 438 2-Hotplate Ranges.

The models D.C. 334 and D.C. 438 are similar in design and construction.

The oven elements are thermostatically controlled on the post-war model D.C. 438, whereas the oven elements are controlled by a 3-heat switch on the pre-war models D.C. 334 and D.C. 438.

On the models D.C. 334 and D.C. 438 where 3-heat oven control is used, the side and bottom oven elements are so arranged that when switched to "LOW" the two top side elements are connected in parallel and in series with the two lower side and the bottom elements which are also connected in parallel, and in series with the two lower side and the bottom elements which are also connected in parallel. When switched to "MEDIUM" the two lower side and bottom elements are connected in parallel. When switched to "HIGH", the five elements are connected in parallel.



GEC DC438 RANGE
 RATING 6.05 kW
 POST-WAR MODEL

ITEM NO.15 - G.E.C. D.C. 113 3-HOTPLATE RANGE.

1. Manufacturer.

Since December, 1948 the British General Electric Co. Pty. Ltd. has sold "Magnet" D.C. 113 ranges produced in the factory of the General Electric Company, England.

2. Location of Fuses.

The four (4) G.E.C. Minor porcelain fuses are located behind the lower front panel as shown in Appendix "A" attached.

3. Removal of Splash Back and Hob.

It is necessary to remove the hob to replace hotplates and detach side panels.

The hob is held in position at the rear by two $\frac{1}{4}$ " studs which are secured to the splash back. The studs pass through two $\frac{5}{16}$ " holes in the rear of the hob and enter two $\frac{5}{16}$ " I.D. tubes welded to the frame of the range.

The front of the hob is secured by two sliding clips located behind the grill door. They slide outwards to engage in two lugs located below the front of the hob.

To remove the hob:-

- (a) Detach splash back by lifting it from the locating holes in the rear of the hob.
- (b) Open warming oven door.
- (c) Firmly grip the two sliding clips and slide inwards.
- (d) Detach hob from range by lifting vertically.

4. 1800 W. and 1000 W. Cast Hotplates.

These hotplates are of the plug-in type using four $\frac{1}{4}$ " brass pins.

5. 2000 W. Grill-Boiler Hotplate.

This hotplate is of the plug-in type using four $\frac{1}{4}$ " brass pins.

6. Oven Elements.

The oven element assembly consists of four 562 watt radiant elements connected in parallel on two $\frac{3}{4}$ " x $\frac{1}{8}$ " tinned copper busbars mounted behind the back panel.

Two elements are mounted on each side of the oven interior, the outside element on each side extending approximately 7" across the bottom of the oven interior.

G.E.C. 113 3-Hotplate Range.ITEM NO.15 (CONT'D).

The elements are not interchangeable, and shall be distinguished by left and right hand radiant oven elements.

To remove an oven element:-

- (a) Remove baking dish and oven slides.
- (b) Remove two vitreous enamelled oven racks by lifting the lug on top front edge from the nickel-plated cheese head stud located on front side of oven interior. Then slide the rack forward.
- (c) Raise front of bottom oven element cover approximately 4" and slide forward.
- (d) Remove back panel.
- (e) Disconnect four monel conductors from busbars by unscrewing two $\frac{1}{2}$ " x $\frac{3}{16}$ " stove screws.
- (f) Remove fish spine beads from monel conductors.
- (g) Remove $\frac{3}{16}$ " hexagon nut from screw securing calrod support to side of oven interior.
- (h) Detach calrod element assembly from oven by sliding forward.

7. Wiring.

The wiring is of 1/.064 asbestos cambric covered, and is readily accessible for inspection, testing or replacement after removing the left and right side panels, lower panel and duralium back panel.

The duralium back panel may be detached by removing four $\frac{1}{2}$ " x 3" stove screws.

8. Oven Thermostat and Indicator Light.

The oven elements are controlled by a G.E.C 260 V. A.C. 15 amp. Cat.No. 7991 thermostat fitted behind the side panel. This thermostat is operated by a black moulded knob above the 3 and 6 heat switches and is turned clockwise to raise the temperature.

Located on the thermostat spindle behind a glass window in the switch panel is a white plastic indicating dial calibrated from 200°F to 550°F. in 15 calibrations and possesses an "OFF" position.

The 3.5 volt lamp located above the control knob is connected in parallel with a shunt to indicate a white light when the elements are in circuit.

The wiring diagram for the 15 amp. G.E.C. Thermostat is detailed in Appendix "C".

ITEM NO.15 (CONT'D).9. Positions of Switch and Oven Thermostat Knobs.

The positions "LOW", "MED" and "HIGH" on the panel around the 3-heat switches controlling the Griller-Boiler and 1000 W. hotplate and the positions "SIMMER", "L", "M", "H" and "HIGH", "MED" and "LOW" on the panel around the 6-heat switch controlling the 1800 W. hotplate are indicated in black letters.

The work "SIMMER" is indicated in red letters on the left side of the 6-heat switch. The figure "0" denoting "OFF" is indicated on the switch panel on a red background.

The knobs controlling the oven thermostat and switches are mounted one above the other at the right hand side of the oven. They are placed as follows:-

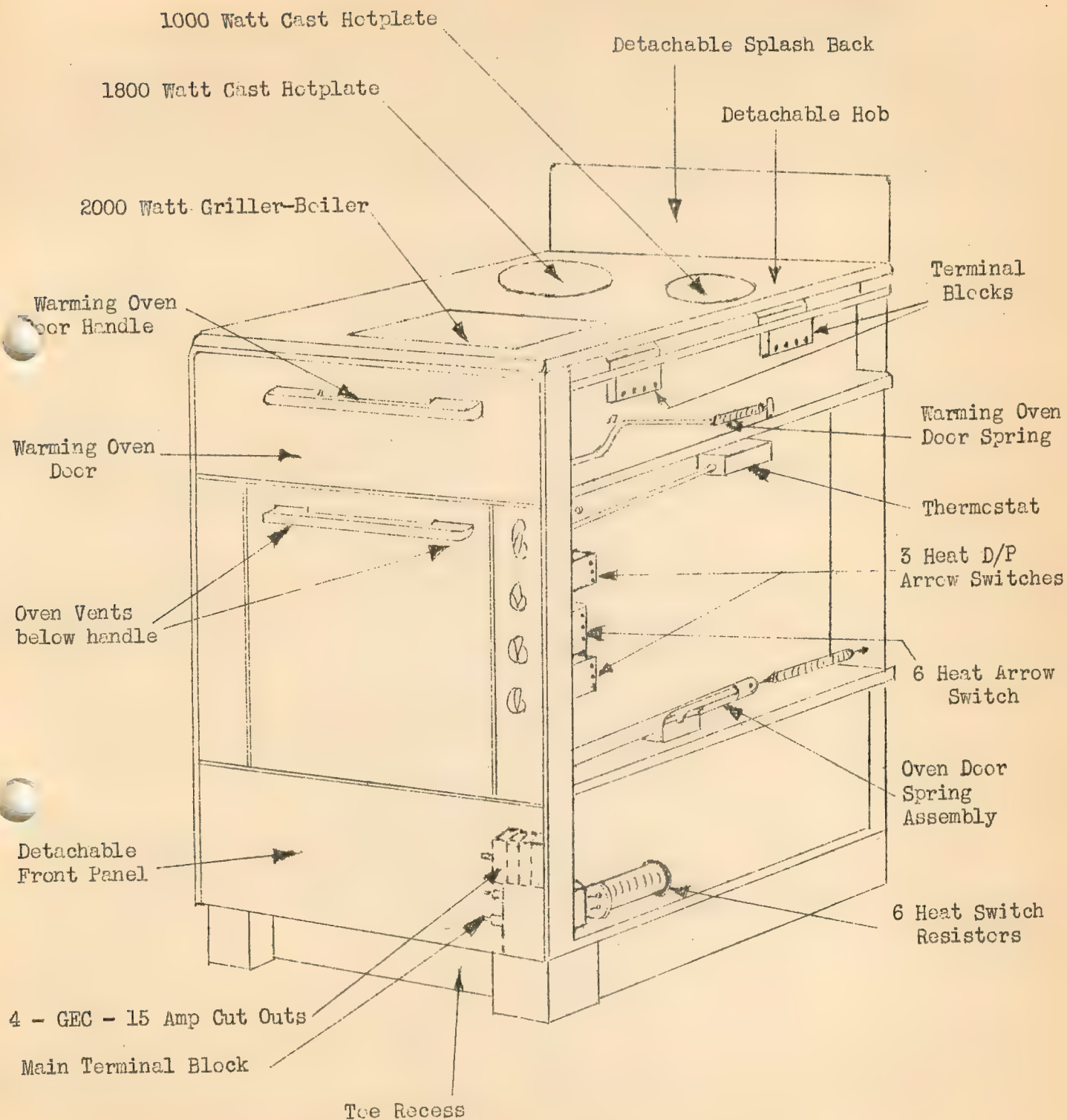
Top Knob: Oven thermostat. Switch panel marked "OVEN-MASTER."
2nd Knob: 2000 W. Grill-Boiler. Switch panel marked "GRILL-BOILER".
3rd Knob: 1800 W. hotplate. Switch panel marked "LEFT BOILING PLATE."
4th Knob: 1000 W. hotplate. Switch panel marked "RIGHT BOILING PLATE."

The switches may be turned in either direction and the switch and thermostat knobs are interchangeable.

Switches may be inspected by removing the right side panel.

The wiring diagram for the 6-heat switch is detailed in Appendix "C".

APPENDIX "A".



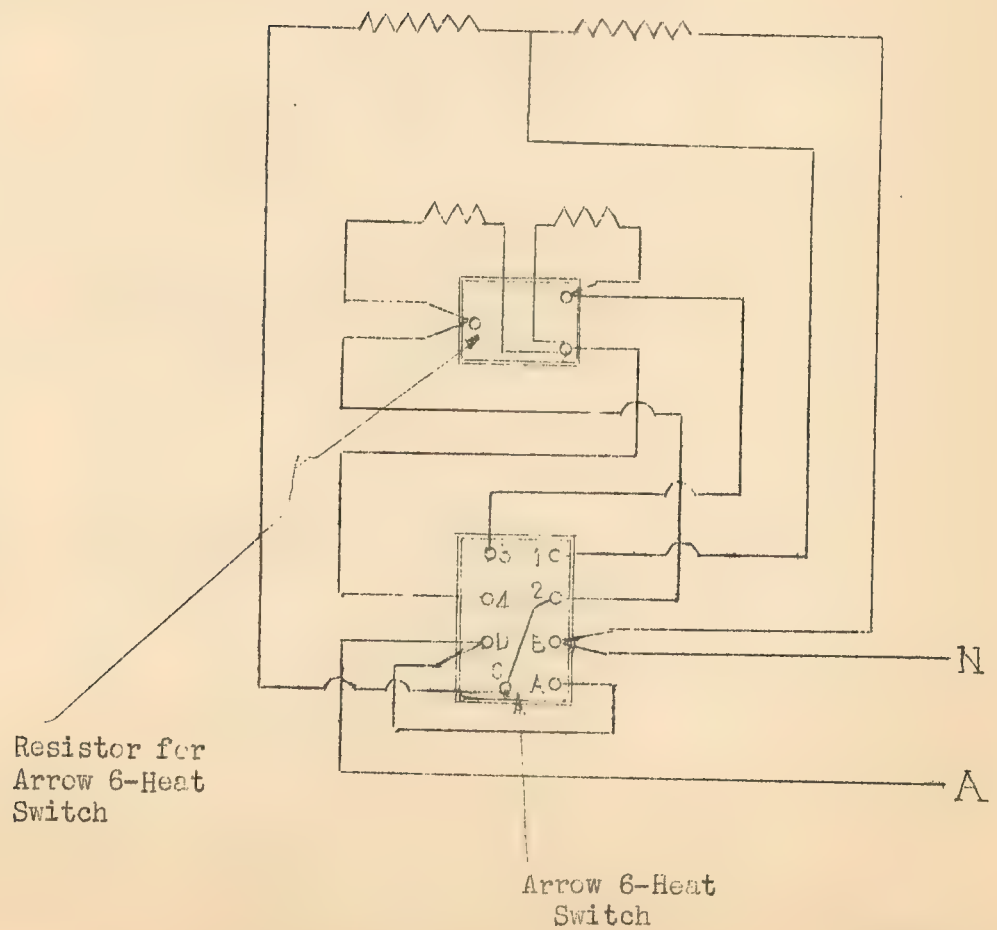
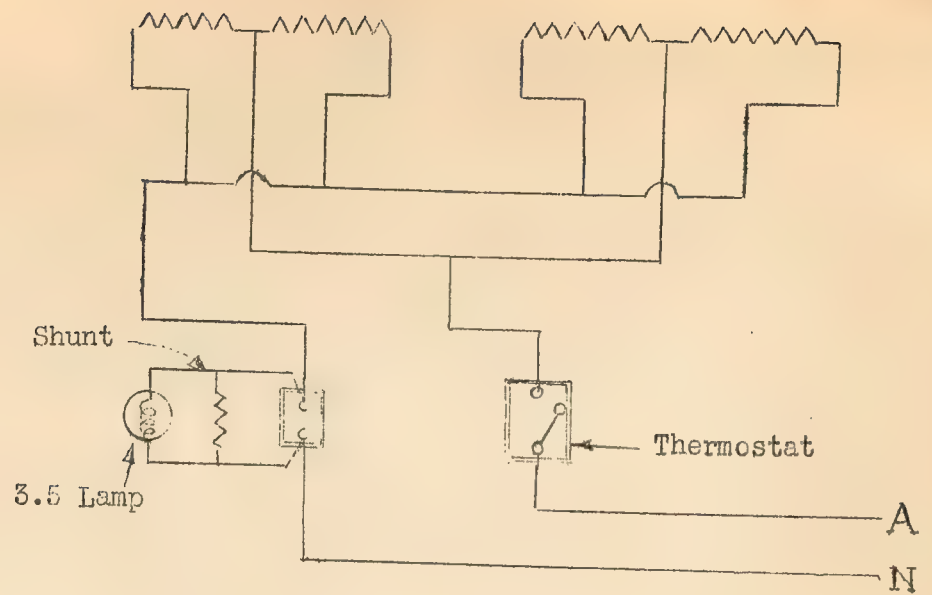
MAGNET D.C. 113 RANGE

Loading 7.05 kW.

APPARATUS SERVICE INSTRUCTION No. 63.
MAGNET DC. 113 RANGE - APPENDIX "B3"

Loadings of 1800 W, 250 W, Cast Hotplate used in conjunction with Arrow 6 Heat Switch on DC 113 Range.

Switch Position	Hotplate Loading	Energy dissipated in external resistance	Total Loading
High	1800 watts	--	1800 watts
Medium	900 watts	--	900 watts
Low	450 watts	--	450 watts
Simmer High	254 watts	88 watts	342 watts
Simmer Medium	162 watts	111 watts	273 watts
Simmer Low	82 watts	112 watts	194 watts



ITEM NO.16 - AMERICAN HOTPOINT RANGES.

1. Manufacturer.

In 1945, the Council purchased thirty-four Cat. 109, RB.14 cabinet model "Hotpoint" electric ranges manufactured by the Edison General Electric Appliance Co. of America.

2. Location of Fuses.

The Pyrex fuses on the three hotplates and the heating element of the Deepwell cooker screw into "Knox" porcelain fuse holders, secured to a pressed steel bracket beneath the switches at the front of the utility drawer.

A 20 amp. "Protex" fuse is fitted adjacent to the Pyrex fuses to protect the oven elements.

3. Tilting of Hob.

The hob shall be raised and tilted for replacement of the three hotplates, five switches, thermostat, porcelain fuse holders and wiring.

To tilt the hob :-

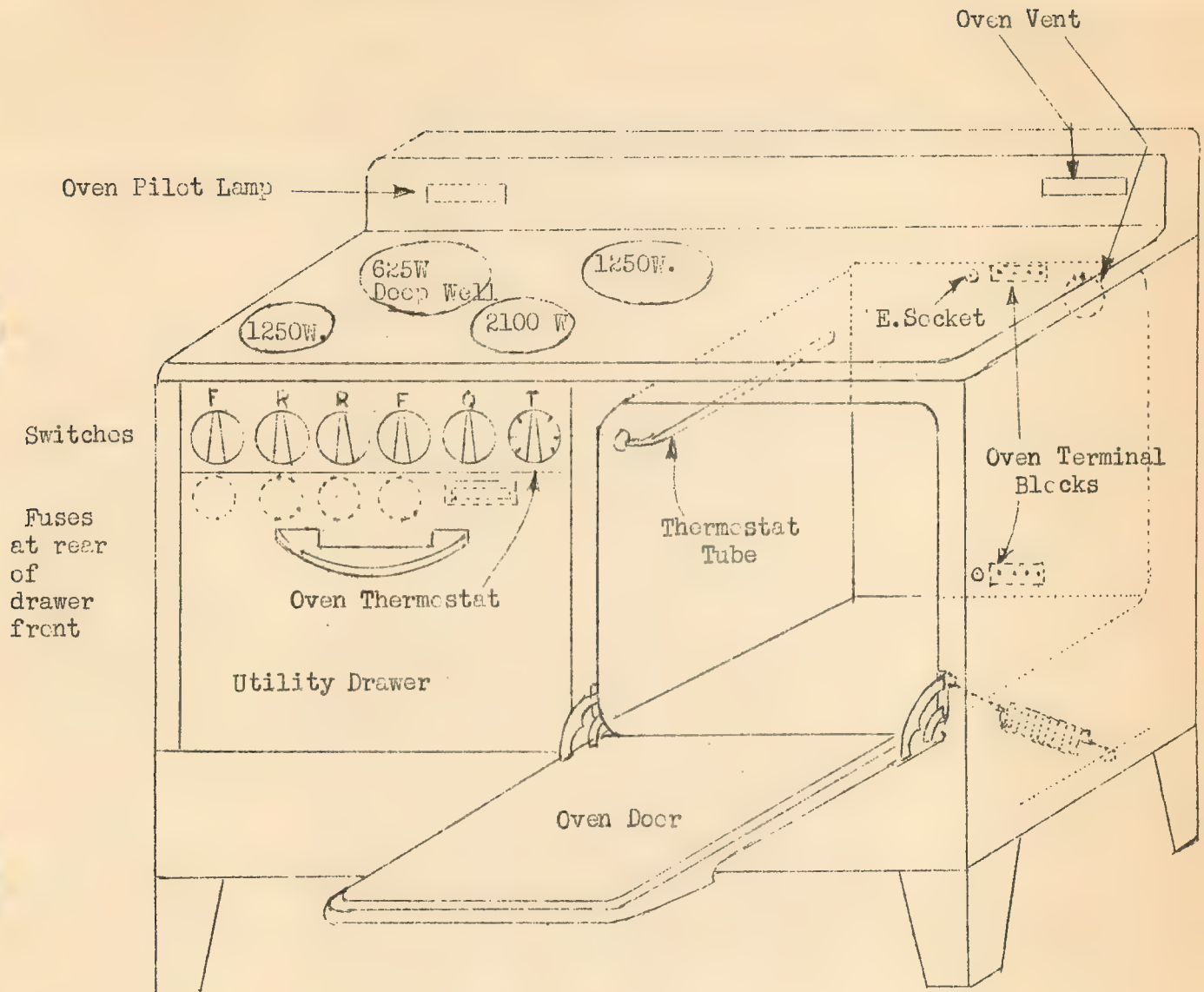
- (a) Pull off the six plastic switch knobs.
- (b) Remove the two screws from the lower flange of the switch panel.
- (c) Slide the panel $\frac{1}{2}$ " to the left and detach it from the range.
- (d) Unscrew the two self-tapping screws, 7" from either end, securing the detachable "T" piece of the hob to the front frame.
- (e) Remove the chrome-plated grill marked "Electric", from the oven vent at the right hand side of the splash back.
- (f) Unscrew the two screws holding the vent to the hob.
- (g) Tilt the 2100 watt hotplate, remove the reflector pan and unscrew the 2" round head self-tapping screw holding the 3" x 1" M.S. strip (spot welded to the hob) to the inclined cover strip bracing the front and rear frames of the range.
- (h) Unscrew the two self-tapping screws from the cover strip at the rear of the splash back and detach the cover strip.
- (i) Slide the hob forward one inch.

The hob may now be tilted and supported at any angle with a support (approx. 17" long) mounted vertically between the front flange of the hob and the top of the oven.

4. Wiring.

All wiring is readily accessible for inspection, testing and replacement after removing the hob.

LAYOUT OF AMERICAN "HOTPOINT" RANGE.



ITEM NO.17 - A.G.E. "HOTPOINT" MODEL L.M.36 3-HOTPLATE RANGE.

1. Manufacturer.

The first post-war range known as the type LM.36 was produced by the Australian General Electric Pty. Ltd., Sydney, at their factory in Auburn.

2. Location of Fuses.

The Pyrex fuses are located at the front of the range. They are readily accessible after removing the drip tray.

3. Removal of Combination Hob and Splash Back.

It is necessary to remove the hob to replace hotplates, 3-heat switches, Simmerstat, fuse receptacles, hotplate terminal block and main terminal block.

To remove the hob:-

- (a) Unscrew the two $\frac{1}{2}$ " x $\frac{3}{16}$ " special raised head nickel plated screws securing the "Hotpoint" nameplate to the splash back.
- (b) Raise the back of the hob clear of the rear hotplate.
- (c) Detach the hob from the range by sliding forward until the front edge of the hob disengages from the edge of the folded metal switch cover in front of the range.

4. Control of 1200 Watt Cast Hotplate.

The 1200 watt cast hotplate is controlled by a "Sunvic" type T.Y.C. 2500 W. "Simmerstat" fitted with a white plastic knob marked "Simmerstat" - "Off". The knob is calibrated in 11 divisions between markings "O" and "S".

IMPORTANT. The knob is rotated clockwise from "OFF" to "5" and anticlockwise from the "5" to "OFF" position.

Simmerstats T.Y.C. and T.Y.K. are described in Item No.40.

5. Oven Elements

Both top and bottom elements are of the plug-in type.

10. Wiring.

The range wiring is readily accessible for testing or replacement after removing the hob, folded metal covers over the top of switches, main terminal block, female sockets, and wiring at left side of drip tray.

6 1/2" 600 W Cast H.P.

8" 1200 W Cast H.P.

8" 1600 W M.V. Casted H.P.

4-15 Amp. Australian

Arrow Switches

5 Pyrex Buses

TYC Sintered

Drip Tray

Oven
Door
In H.
Opening

Door Handle

Rating Plate

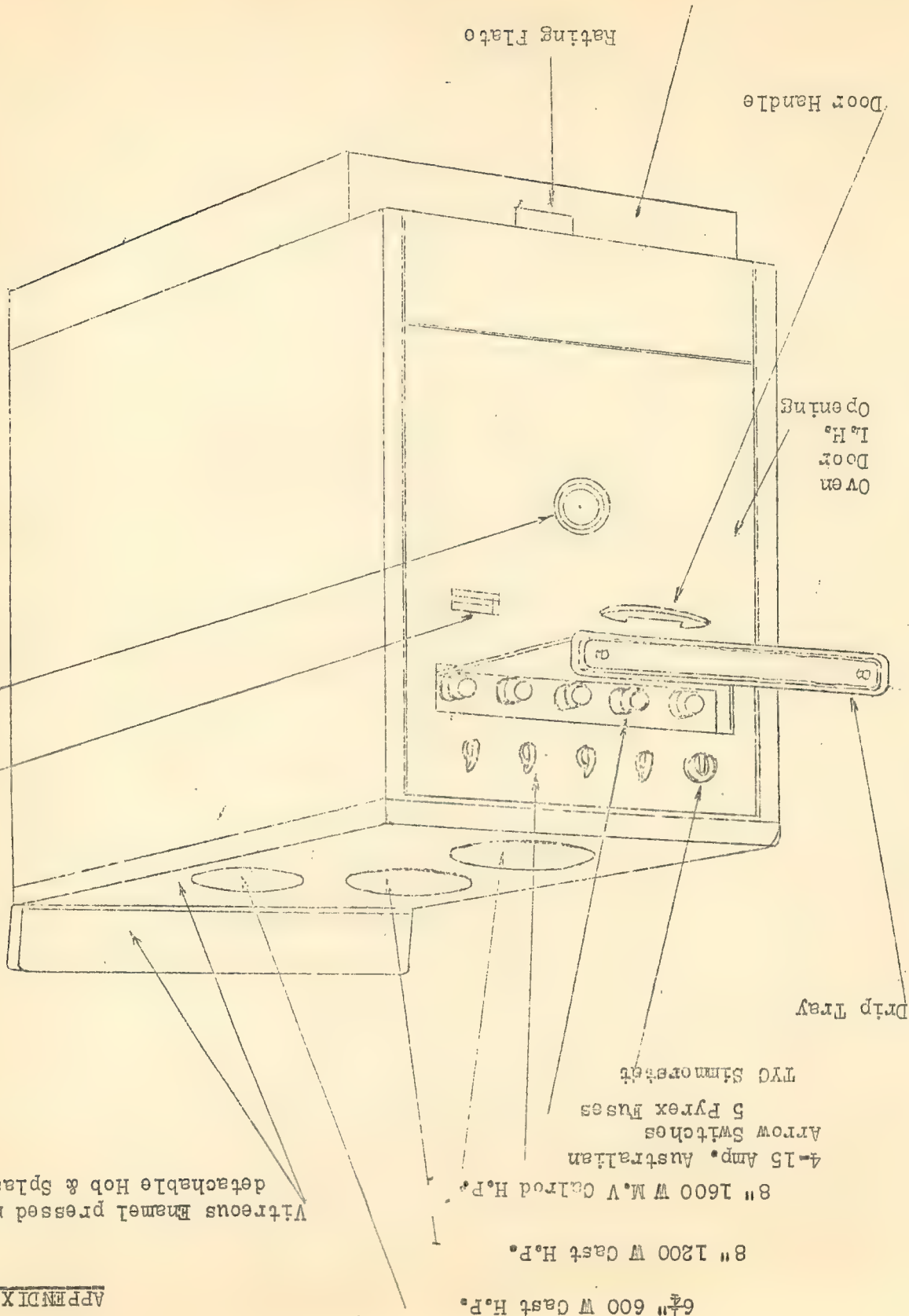
Main Terminal Block under splash back

Vitreous Enamel pressed metal
detachable Hob & Splash Back

Oven Vent
Rototherm
H.M.

APPENDIX "A"

A.G.E. HOPOINT RANGE



1941-42 0'0 13

1941-42 0'0 13

ITEM NO. 18. "A.G.E." HOTPOINT" RANGES.

1. Manufacturer.

A.G.E. Hotpoint ranges were manufactured in Sydney by Metters Ltd.
for the Australian General Electric Pty.Ltd.

2. Location of Nameplate.

The nameplate is located:-

- (i) Model No. CM.3 -
 - (a) Top of left hand side panel
 - (b) Latest models - inside warming oven.
- (ii) Models No. CA.3 and CA.2
 - (a) On N.P. band - front of range.
 - (b) On N.P. band - bottom of left hand side panel.
 - (c) Latest models - above terminal box under hob.
- (iii) Model No. LA.2.
 - On N.P. band - bottom of right hand side panel.
- (iv) Models No. LB2, LM2, LM3.
 - (a) Top side of right hand side panel.
 - (b) Latest models - above terminal box under hob.

3. Location of Fuses.

- (a) Model No. CM.3
 - Fuses are located in utility drawer below switch panel.
- (b) Models No. CA3, CA2, LA2.
 - Fuses are located behind panel at front of range.
- (c) Models No. LB2, LM2, LM3.
 - Fuses are located behind right hand side panel.
- (d) Models No. LM2, LM3.
 - Fuses are located behind drip tray below switch panel at front of range.

4. Hob.

The hobs are either hinged or lift up.

5. Hotplates.

The hotplates are bolted to a cast cradle. For removal
see Item No. 17.

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ITEM NO. 19. "HECLA" COMMERCIAL COOKING APPLIANCES.

1. Manufacturer.

Hecla commercial cooking appliances are manufactured in Australia by Hecla Electrics Pty.Ltd.

2. Description.

Hecla Pastry Ovens and Roasting Ovens are made in single and double decks. The letter "S" in the catalogue number denotes single deck and the letter "D" denotes double deck.

3. Location of Rating Plate.

The rating plate on all models is located at the side of oven.

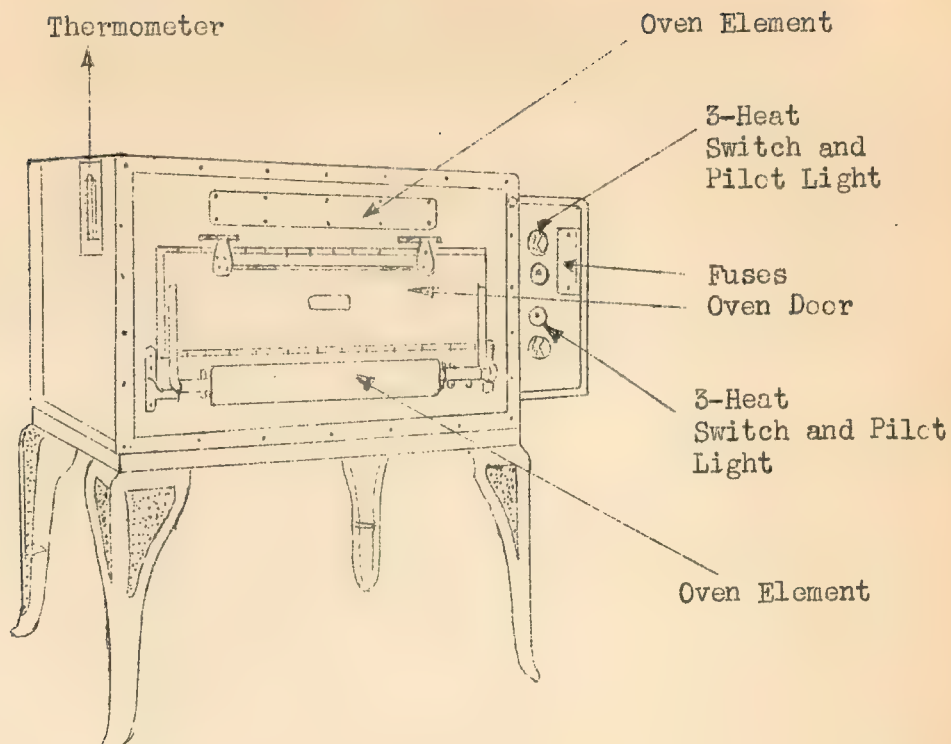
4. Layout of Component Parts.

The layout of the larger model pastry oven, Cat.No. COS20 and a small model pastry oven Cat. No. COS.40 are shown in Appendix "A".

5. Location of Fuses.

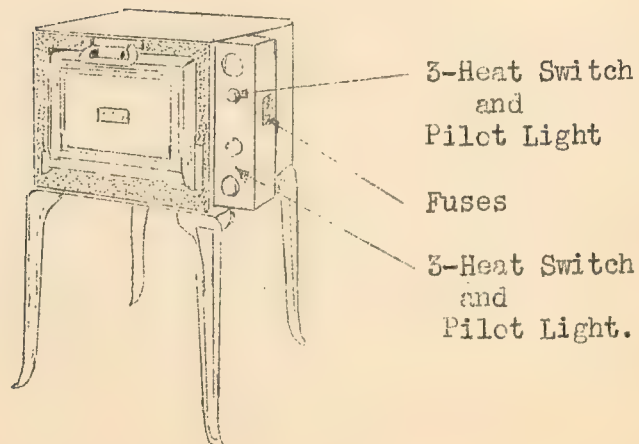
The fuses are located:-

- (a) Hecla Pastry Ovens, Cat.Nos. COS20, COD20, COS30, COD30, COS50, COD50 - behind small plate at switch panel.
- (b) Hecla Pastry Ovens, Cat.Nos. COS40, COD40 - behind right hand side panel.
- (c) Hecla Roasting Ovens, Cat. Nos. COS21, COD21 - behind small plate at switch panel.
- (d) Hecla Roasting Ovens, Cat.Nos. COS51, COD51 - behind small plate at switch panel.
- (e) Hecla Hot Press and Bain-Marie, Cat. No. CH3B - behind right hand side panel.
- (f) Hecla Bread Baking Oven, Cat. No. COS4 - behind right hand side panel.



"HECLA" PASTRY OVEN.

CAT. NO. COS20.



"HECLA" PASTRY OVEN
CAT. NO. COS40.

ITEM NO. 20.- McCLARY RANGES.

1. Manufacturer.

McClary ranges are manufactured in Canada by General Steel Wares Ltd.

2. Location of Nameplate.

The nameplate may be located at :-

- (a) Top of right hand side panel or
- (b) Top of left hand side panel or
- (c) Back panel.

3. Location of Fuses.

(a) Models No. 1, 2,	W2, 3	4-1,	5,	6,	7
2-1		4-2	5-1	6-1	7-1
2-2			5-2	6-2	7-2
2-3				6-2	

Fuses located behind right hand side panel.

(b) Models No. 8 and 82 :-

Fuses located under left front bottom of range.

Models No. 15, 15-1, 15-2, 15-3, 15-4, 15-5:-

Fuses located behind front panel beneath switches.

(c) Models No. 16,	17,	18,	19,	20,	21,	22,
16-1	17-1	18-1	19-1	20-1	21A	22-1
16-2	17-2	18-2	19-2	20-2		22-2
16-3	17-3	18-3	19-3	20-3		22-2
			19-4			

Fuses located behind switch panel 19-5
below switches

(d) Model No. 23:-

Fuses beneath oven at front of range.

(e) Model No. 26:-

Fuses located below switches at front of range.

4. Hob.

The hobs on McClary ranges are fixed.

5. Hotplates.

McClary hotplates are of the plug-in type.

Some hotplates may be removed by lifting upwards and others by sliding forward with a slight upward lift.

ITEM NO. 21. K.F.B. HOTPOINT RANGES.

1. Manufacturer.

K.F.B. Hotpoint ranges were manufactured in Sydney by K.F.B. Foundry Ltd.

2. General.

The manufacture of these ranges has long since ceased and many will be found with improvised parts.

The original ranges were fitted with calrod hotplates and oven elements of the plug-in type.

3. Location of Fuses.

Fuses were not fitted on the range as the manufacturers considered they were not essential.

Fuses were later fitted to some ranges and are located below the range on the left hand side.

ITEM NO.22 - "JACKSON" RANGES. MODELS NO. 91JR AND 92 J.

1. Manufacturer.

Jackson ranges are manufactured in England by the Jackson Electric Stove Co. Ltd. and are distributed in Sydney by Electric Ranges (Aust.) Pty.Ltd.

2. Description.

Models No. 91JR and 92 J are similar in all details except that the oven dimensions of Model No. 92J are larger.

Both models are of pre-war design and are somewhat similar to Model No. 192J/4, exceptions being that on Models No. 91JR and 92J,

- (a) The legs are cabriole type.
- (b) The control panels are comprised only of 3-heat switches.
- (c) The oven doors are fitted with mercury type thermometers.
- (d) A pot shelf is fitted below the oven.

Model No. 192J/4 is detailed in Item No.25.

3. Location of Rating Plate.

The Rating Plate is located at the back of the range.

4. Location of Fuses.

The fuses on Models No. 91JR and 92J, are located behind small plate under switches at lower right front.

5. Lifting of Hob.

The hob is hinged at the rear. To raise it -

- (a) Fold splash back forward. (Splash back hinged).
- (b) Open hot cupboard door.
- (c) Unscrew hex. head screw located on bottom of hob at front centre.
- (d) Raise the hob.

6. Hotplate.

The $8\frac{1}{2}$ " x 6", 1700 watt cast hotplate controlled by a 3-heat switch is of the plug-in type using brass contact pins. To remove it -

- (a) Raise the hob (refer paragraph 5).
- (b) Firmly grip the front and back sections of hotplate and lift upwards.

Jackson Ranges
Models 91JR & 92J.

2.

ITEM NO.22 (CONT'D).

7. Grill Boiler.

The 9" x 7 $\frac{5}{8}$ ", 2000 watt Grill Boiler controlled by a 3-heat switch is of the plug-in type using brass contact pins.

To remove it,

- (a) Raise the hob (refer paragraph 5).
- (b) Firmly grip the front and back sections of Grill Boiler and lift upwards.

8. Oven Elements.

The oven is heated by two oven elements of the plug-in type using three brass contact pins.

One element is located on each side of the oven interior.

The full loading is 1400 watts and is controlled by a 3-heat switch.

To remove an oven element -

- (a) Remove all oven accessories.
- (b) Firmly grip the oven element assembly and slide forward.

IMPORTANT. When fitting an oven element assembly, a final check should be made for full contact. A slight extra pressure may be required to ensure assembly being driven to correct position.

9. Range Terminals.

The range wiring terminals are located behind the right hand side panel.

ITEM NO.23 - "JACKSON" RANGE MODEL NO.192J/1.

1. Description.

Model No.192J/1 is of pre-war design and is somewhat similar to Model No. 192J/4, exceptions being that on Model No. 192J/1 -

- (a) The control panel is comprised only of 3-heat switches.
- (b) The oven door is fitted with a mercury type thermometer.
- (c) A utility cupboard is built in to base or a pot shelf fitted between legs.
- (d) A large splash back is fitted which can be folded forward to completely cover the hob.

Model 192J/4 is detailed in Item No.25.

2. Location of Fuses.

The fuses are located behind the right hand side panel.

3. Range Terminals.

The range wiring terminals are located behind the right hand side panel.

ITEM NO. 24 - "JACKSON" RANGE, MODEL NO. 193J.

1. Location of Fuses.

The fuses are located behind the right hand side panel.

2. Lifting of Hob.

The hob is hinged at the rear. To raise it :-

- (a) Fold splash back forward. (Splash back hinged).
- (b) Open hot cupboard door.
- (c) Unscrew hex. head screw located on bottom of hob at front centre.
- (d) Raise the hob.

3. Hotplates.

The 8" diam. 1800 watt and the $6\frac{1}{4}$ " diam. 1000 watt cast hotplates are of the plug-in type using four brass contact pins.

The 8" diam. hotplate is Simmerstat controlled and the $6\frac{1}{4}$ " diam. hotplate is controlled by a 3-heat switch.

To remove a hotplate:-

- (a) Raise the hob (refer paragraph 2).
- (b) Firmly grip the front and back sections of hotplate and lift upwards.

4. Grill Boiler.

The $10\frac{1}{2}$ " x 8", 2000 watt Grill Boiler is of the plug-in type using four brass contact pins.

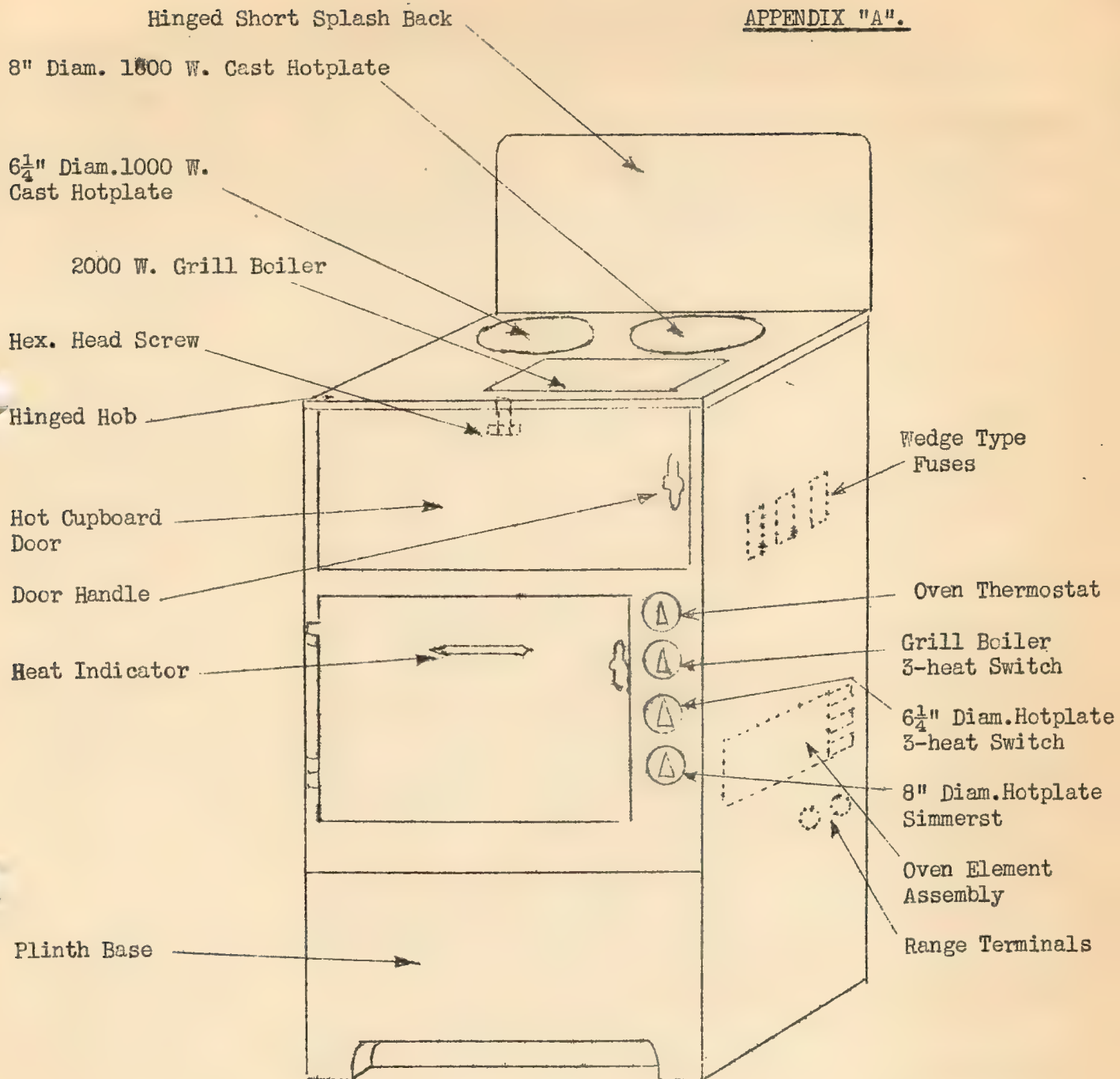
To remove it :-

- (a) Raise the hob (refer paragraph 2)
- (b) Firmly grip the front and back sections of Grill Boiler and lift upwards.

5. Oven Heat Control.

Oven heat control by 3-heat switch or by thermostat with pilot light is optional on Jackson ranges, therefore Model No. 193 J. will be found with the oven elements controlled by either of these methods.

APPENDIX "A".



JACKSON RANGE

MODEL NO. 193J.

ITEM NO.25. "JACKSON" RANGE MODEL NO. 192J/4.

1. Manufacturer.

Jackson Ranges are manufactured in England by the Jackson Electric Stove Co. Ltd. and are distributed in Sydney by Electric Ranges (Aust.) Pty.Ltd. Model No. 192J/4 is of post-war design.

2. Layout of Component Parts.

The layout of switches, hotplates, fuses etc. is detailed in Appendix "A".

3. Location of Rating Plate.

The Rating Plate is located at back of range.

4. Location of Fuses.

The fuses are located behind the right hand side panel.

5. Lifting of Hob.

The hob is hinged at the rear. To raise it :-

- (a) Fold splash back forward (Splash back hinged).
- (b) Open hot cupboard door.
- (c) Unscrew hex. head screw located on bottom of hob at front centre.
- (d) Raise the hob.

6. Hotplate.

The 8" diam. 1800 watt Simmerstat controlled cast hotplate is of the plug-in type using four brass contact pins.

To remove it :-

- (a) Raise the hob (refer paragraph 5).
- (b) Firmly grip the front and back sections of hotplate and lift upwards.

7. Grill Boiler.

The 2000 watt Grill Boiler 8" x 10 $\frac{1}{2}$ " is of the plug-in type using three brass contact pins and an earth pin.

To remove it:-

- (a) Raise the hob (refer paragraph 5).
- (b) Firmly grip the front and back sections of Grill Boiler and lift upwards.

Jackson Range - Model 192J/4.

ITEM NO.25 (CONT'D).

8. Oven Elements.

The oven is heated by two oven elements of the plug-in type using three brass contact pins and an earth pin.

The full loading is 1700 watts.

One element is located on each side of the oven interior.

To remove an oven element:-

- (a) Remove all oven accessories.
- (b) Firmly grip the oven element assembly and slide forward.

IMPORTANT

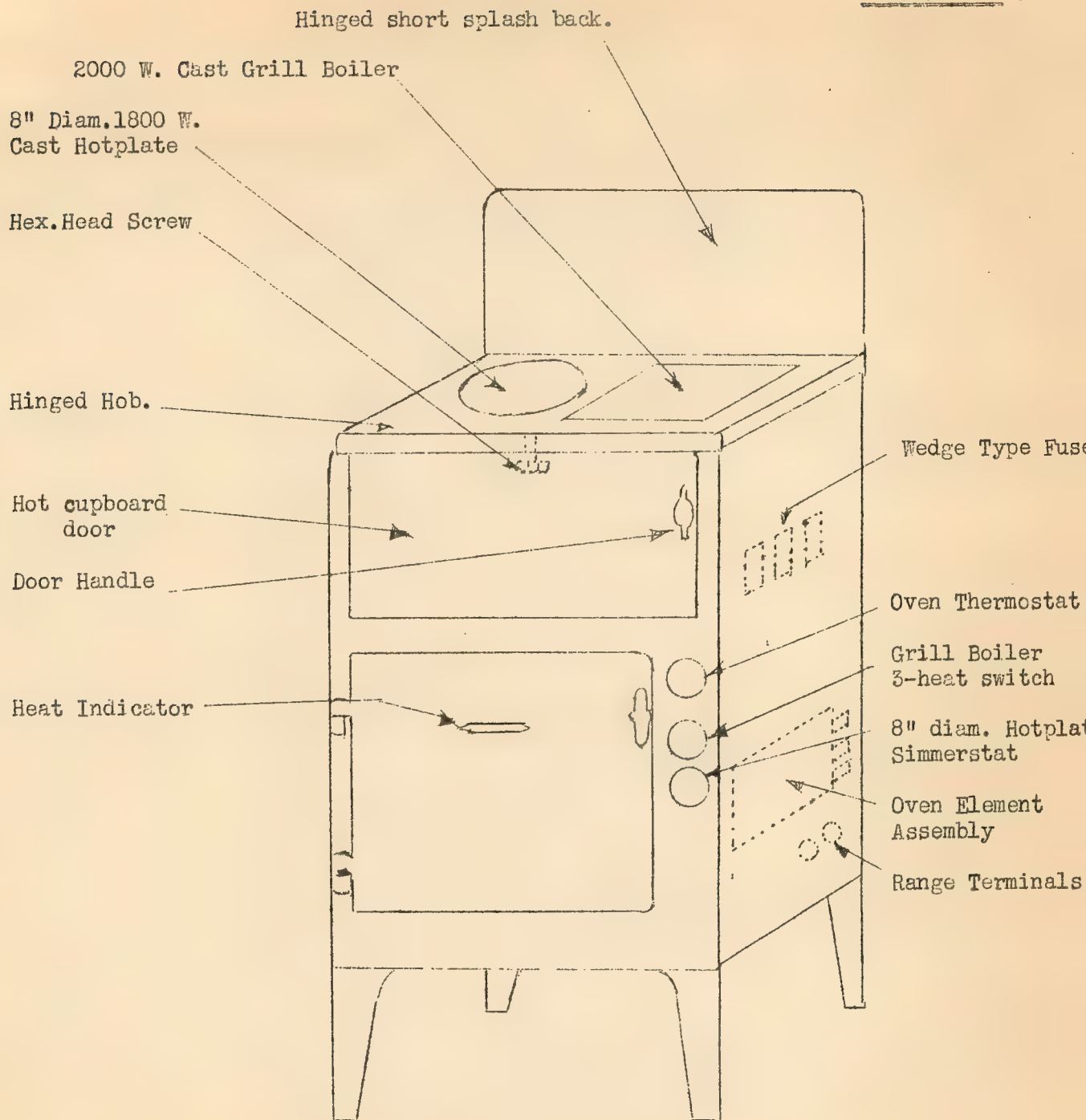
When fitting an oven element assembly, a final check should be made for full contact. A slight extra pressure may be required to ensure assembly being driven to correct position.

9. Oven Heat Control.

Oven heat control by 3-heat switch or by thermostat with pilot light is optional on Jackson ranges, therefore, Model No. 92J/4 will be found with the oven elements controlled by either of these methods.

10. Range Terminals.

The range wiring terminals are located behind the right hand side panel.



JACKSON RANGE.

MODEL NO. 192J/4.

ITEM NO. 26. "MAGNET RANGES.

1. Manufacturer.

"Magnet" ranges are manufactured in England by the General Electric Company.

2. Location of Nameplate.

The nameplate may be located -

- (a) On right hand side panel or
- (b) On back panel.

3. Location of Fuses.

Fuses are located:-

- (a) Model No. D.C.113, behind lower front panel as detailed in Item No.15.
- (b) Behind right hand side panel on all other Models which include :-

D.C. 100	D.C.235	D.C.345	D.C.734
D.C. 105	D.C.333	D.C.434	D.C.735
D.C. 138	D.C.334	D.C.438	D.C.1034.

4. Hob.

The hob is hinged at the rear (Refer Item No.14).

5. Hotplates.

Hotplates are of the plug-in type (Refer Item No.14).

6. The hob is hinged at the rear.

7. Hotplates.

The hotplates are of the plug-in type and may be removed by lifting upwards.

ITEM NO. 27. METTERS RANGES.

1. Manufacturer.

Metters ranges are manufactured in Sydney by Metters Ltd.

2. Location of Nameplate.

(i) Models No.4 and 204 :-

- (a) Top of left hand side panel
- (b) Latest models - inside warming oven.

(ii) Models No.3 and 203 :-

- (a) On N.P. band - front of range.
- (b) On N.P. band - bottom of left hand side panel.
- (c) Latest models - above terminal box under hob.

(iii) Model No.2 :- On N.P. band - bottom of right hand side of panel.

(iv) Model No. 202 :-

- (a) On N.P. band - bottom of left hand side panel.
- (b) Latest models - above terminal box under hob.

3. Location of Fuses.

(a) Models No.2, 202, 204, 205 :-

Fuses located beneath the hob at rear of range.

(b) Models No.3, 203:-

Fuses located beneath the range.

(c) Model No.4:-

Fuses located in utility cupboard below switch panel.

4. Hob.

The hobs on Metters ranges are hinged at the rear.

5. Hotplates.

Metters hotplates are of the plug-in type and may be removed by lifting upwards.

ITEM NO.29 - "PARNALL" TYPE E.C.6 3-HOTPLATE RANGE.

1. Manufacturer.

The "Parmall" type E.C.6, 3-hotplate range is manufactured by Parnall (Yate) Ltd., London, England.

2. Location of Fuses.

The four "MAGNAL" 15 amp. fuses are located below the back of the hob. To renew a fuse, remove splash back and hob as detailed in paragraph 3.

3. Removal of Splash Back and Hob.

It is necessary to remove the hob to replace hotplates, cut-outs, and detach the side panels. The front and two side edges of the hob fit neatly over the dressed front and side edges of the top aluminium casting.

To remove the hob:-

- (a) Detach the splash back by lifting it from the two locating lugs pressed out of the back panel.
- (b) Firmly grip the two sides of the hob and lift upwards.

4. 1800 W. and 1000 W. Cast Hotplates.

These hotplates are of the plug-in type, using four $\frac{1}{4}$ " brass pins.

5. 2000 W. Grill-Boiler Hotplate.

This hotplate is of the plug-in type, using four $\frac{1}{4}$ " brass contact pins.

6. SIDE AND BOTTOM OVEN ELEMENTS.

The oven is heated by three oven elements, one being located on each side of the oven interior and one below the bottom of the oven interior.

The two side elements are of the plug-in type, using four $\frac{1}{4}$ " brass contact pins.

The bottom oven element is located below the oven interior and is provided with two $\frac{3}{16}$ " terminals.

Each side oven element consists of two resistors and the total loading is 1100 watts, whilst the bottom element is a single resistor of 300 watts.

The loading is different on each resistor of the side oven element, the outer being 700 watts and the inner 400 watts.

"Farnall"3 Hotplate Range.ITEM NO. 29 (CONT'D).

The oven elements are controlled by a "Magnall" 250 V., 15 amp. A.C. 2-stage thermostat. The side and bottom oven elements are so connected that when the thermostat is switched on for preheating the two active contacts close and connect the five resistors in parallel. When the oven reaches the predetermined temperature, the first stage of the thermostat switch contacts opens and disconnects the outer resistor of each side oven element.

The oven temperature is maintained by the inner section of each side oven element and the bottom oven element. The loading is now reduced to 1100 watts and in normal operation with this second stage, the "Magnall" thermostat will "cycle".

The wiring diagram of the thermostat and oven elements are detailed in Appendix "B".

The remove a side oven element:-

- (a) Remove the oven slides and baking dish.
- (b) Firmly grip each side of the element assembly and slide forward to disengage the two slotted sections located in the front of the assembly frame from the nickel plated dome studs located on the side of the oven interior.

To remove a bottom oven element:-

- (c) Remove back panel.
- (d) Disconnect two conductors and earth wire by unscrewing three 3/16" hexagon nuts from terminal screws.
- (e) Withdraw element from oven sheath.

7. WIRING.

The wiring is of 1/.064" braided cambric glass-covered wire and is readily accessible for inspection, testing or replacement after removing the left and right side panels, and back panel.

8. SWITCH IDENTIFICATIONS AND POSITIONS.

The positions "OFF", "LOW", "MED" and "HIGH" on the three "Magnal" 15 amp. 3-heat hotplate switches are indicated in block letters on the white plastic knobs. The knobs controlling the oven thermostat and switches are mounted one above the other at the right hand side of the oven.

8.(cont'd).

They are placed as follows:-

Top knob: Oven 2-stage thermostat. (Knob marked "OVEN").
2nd knob: 2000 W. grill-boiler (Knob marked "GRILL").
3rd knob: 1000 W. hotplate (Knob marked "PLATE").
4th knob: 1800 W. hotplate. (Knob marked "PLATE").

The switches may be turned in either direction and hence care must be exercised when replacing each knob.

9. OVEN THERMOSTAT AND INDICATOR LIGHT.

The oven elements are automatically controlled by a "Magna" 250 V. 15 amp. 2-stage thermostat fitted behind the right hand side panel. This thermostat is operated by a white plastic knob located above the three 3-heat switch knobs and is turned clockwise to raise the temperature and anti-clockwise to lower the temperature. The central knob is calibrated from 200° to 550°F. in 15 calibrations and possesses an "OFF" position.

As already indicated in paragraph 6, this thermostat provides oven loadings of 2,500 and 1100 watts, the former for preheating and the latter for maintaining constant oven temperature after preheating.

The thermostat operates on the micro break principle with magnetic snap action created by one permanent magnet.

The 3.5 volt lamp located behind the control knob is connected in parallel with a shunt.

The pilot lamp functions as follows:-

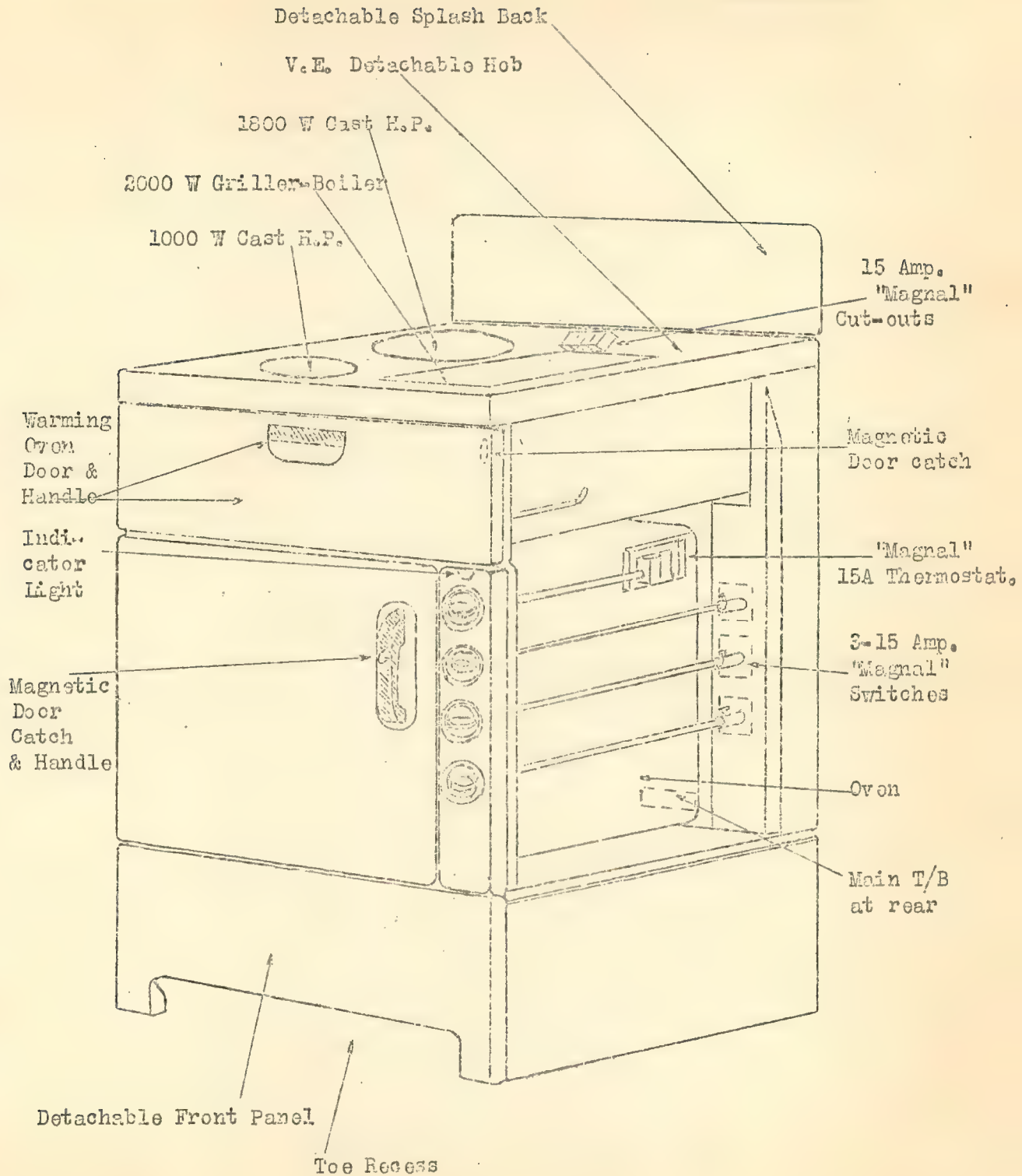
- (i) Thermostat in "OFF" position - No glow on pilot lamp.
- (ii) Thermostat set for preheating - Full glow on pilot lamp.
- (iii) Thermostat cycling after preheating - Half glow when element loading is 1100 watts, and full glow with element loading of 2500 watts.

The customer will know that the oven is ready for use after preheating when the pilot lamp changes from full to half glow, or ceases to glow.

10. Oven Door Catch.

The oven door catch is of the magnetic type consisting of an "ALNICO" horse-shoe magnet located behind the aluminium main front casting on the right hand side of the range.

APPENDIX "A".



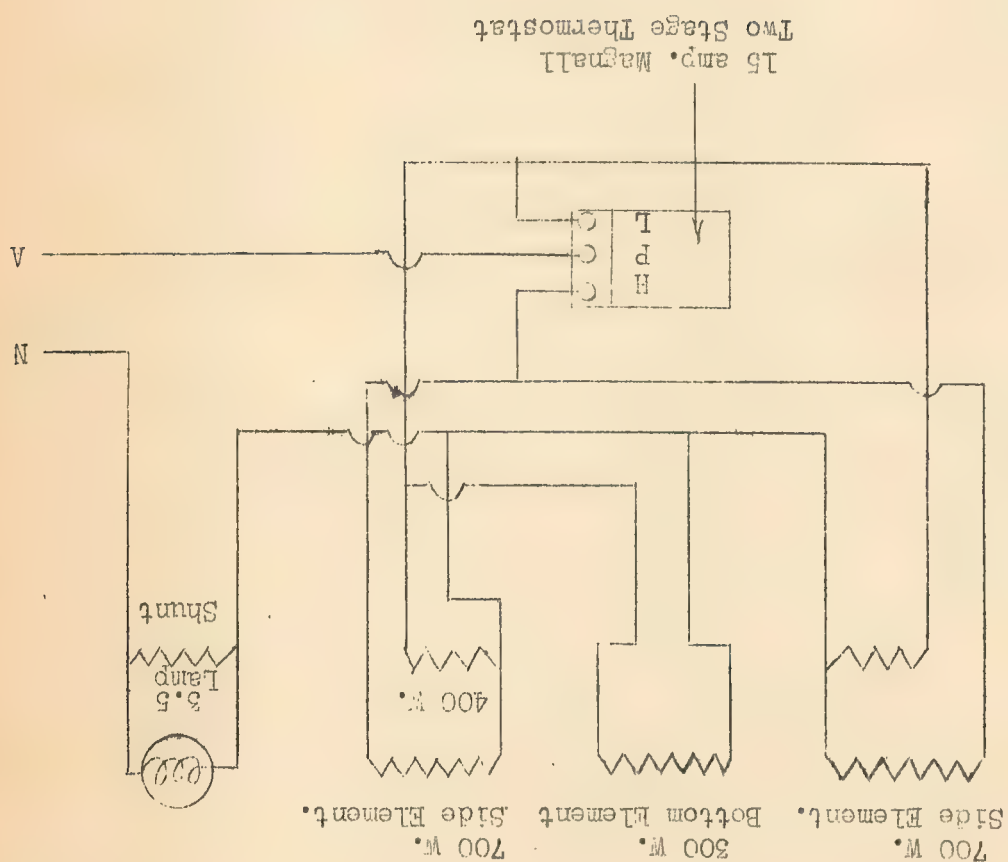
Nameplate fitted to back panel

Ventilation provided by Air gap at top of Oven Door

A. C. F. - 1911

A. C. F. - 1911

APPENDIX "B"



ITEM NO.30 - "RITEMP" CAT.2004S 2-HOTPLATE RANGE.

1. Manufacturer.

"Ritemp" electric ranges are manufactured in England by the English Electric Co.

2. Location of Fuses.

The "Triumph" 15 amp. fuses are located behind side panel on right of range.

3. 1800 Watt Cast Hotplate.

This hotplate is of the plug-in type using three (3) $\frac{1}{4}$ " N.P. pins in line for active conductors and one $\frac{1}{4}$ " N.P. pin located in front of active pins for earth conductor.

To remove a cast hotplate:-

- (a) Lift the hob.
- (b) Firmly grip the front edge of the hotplate and the back section of the cast iron cradle and lift upwards.
- (c) Remove 5/16" hexagon nut, two 2BA x 3/8" G.H. brass screws, earthing pin and cover plate.
- (d) Disconnect beaded conductors from contact pins on porcelain terminal block and remove hotplate from cast iron cradle.

4. Control of 1800 W. Cast Hotplate.

The 1800 W. cast hotplate is controlled by a "Sunvic" type T.Y.K. 2500 watt Simmerstat fitted with white plastic knob identical in shape to that on 3-heat switch and Satchwell thermostat. The knob markings are indicated in black lettering and figures as follows:- "LARGE PLATE", "OFF", "ON", "FULL" and is calibrated in 21 divisions between markings "ON" and "5" for simmering purposes. For quick boiling, the knob should be turned to "FULL". When the Simmerstat is switched to "FULL", there is no cycling action.

IMPORTANT. The knob is rotated clockwise from the "OFF" to "FULL" position and anti-clockwise from "FULL" to "OFF" position.

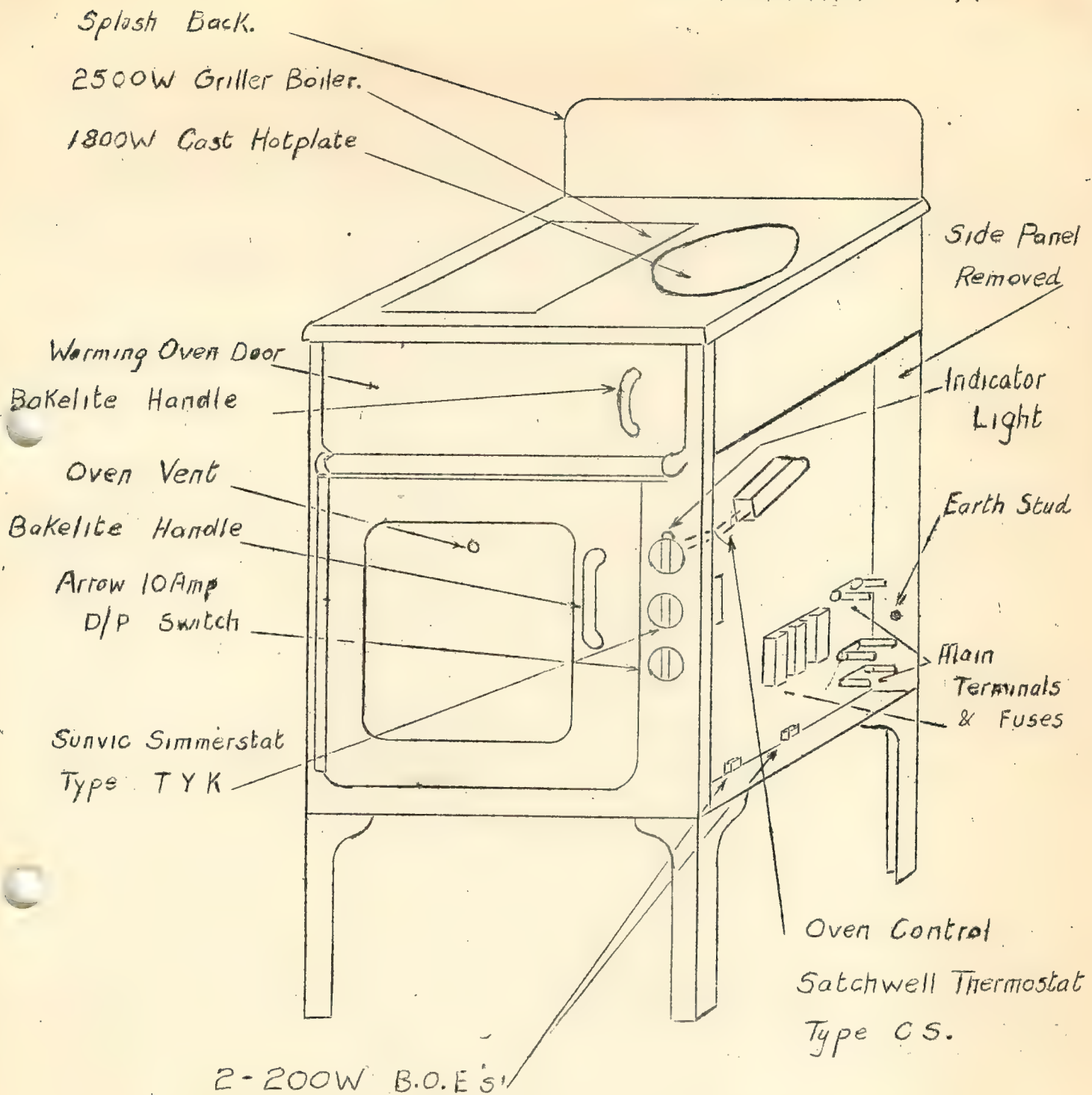
Simmerstats are described in Item No.40.

5. Oven Elements.

The oven elements are of the plug-in type.

6. Wiring.

The wiring is readily accessible after removing the side panel, fibre panel and back panel.



LAYOUT OF "RITEMP" RANGE.

Model 2004 S.

BILENB

BILENB

ITEM NO.31 - "RITEMP" CAT. H.C.212 2-HOTPLATE RANGE.

1. Description.

"Ritemp" Cat. H.C.212 has been recorded to distinguish this model from No.2004S described in Item No.30.

The English Electric Co. has discontinued the manufacture of "Ritemp" Cat. 212 and substituted "Ritemp" Cat. 2004S.

2. Location of Fuses.

The three (3) 15 amp. M.E.M. cut-outs are located behind the panel on the right hand side as shown in Appendix A.(See also "Removal of Lower Right Hand Side Panel.")

3. Removal of Lower Right Hand Side Panel.

It is necessary to remove the side panel for connection or disconnection of range, replacement of fuses, bottom oven elements, 3 heat switches, and replacement or adjustment of oven thermostat.

To remove the side panel:-

- (a) Remove the two 2BA x $\frac{1}{2}$ " knurled head screws from back edge and one 2BA x $\frac{1}{2}$ " stove bolt from bottom centre panel.
- (b) Detach the panel. (The fuses will now be exposed).

To obtain access to the fuses, switches, thermostat, bottom oven elements and wiring, it is then necessary to remove the fibro panel. To do this, unfasten the two No.6 x $\frac{1}{2}$ " self-tapping screws located at the bottom of the panel.

4. Lifting of Hob.

The hob is hinged at the rear. To raise it:-

- (a) Detach splash back by lifting it from the locating holes in the rear of the hob.
- (b) Open warming oven door.
- (c) Loosen special No.2BA x $\frac{3}{8}$ " knurled head screw situated under front centre edge of hob.
- (d) Raise the hob and support it with the hinged strap on the left hand side.

5. Oven Elements.

The oven element assembly consists of four 450 watt plug-in type side oven elements (two elements being located on each side of the oven interior) and two 200 watt bottom oven elements located under the bottom of the oven interior.

"Ritemp" H.C. 212 2-Hotplate
Range.

2.

ITEM NO. 31 (CONT'D).

6. Oven Thermostat and Indicator Light.

The oven elements are automatically controlled by a "Satchwell" type C/S 15 amp. 250 V. thermostat fitted behind the side panel. This thermostat is operated by a white plastic knob located above the two 3-heat switches and is turned clockwise to raise the temperature. The control knob is calibrated from 200° to 550°F. in 15 calibrations and possesses an "OFF" position.

The 2.5 volt lamp located above the control knob is connected in parallel with a shunt to indicate a red light when the elements are in circuit.

7. Description of 3-Heat Switches.

The five different types of switches being used on "Ritemp" H.C. 212 ranges are as follows:-

- (a) Diamond S-pole.
- (b) Santon S-pole.
- (c) Turnright S-pole.
- (d) English Arrow S-pole.
- (e) English Arrow D-pole.

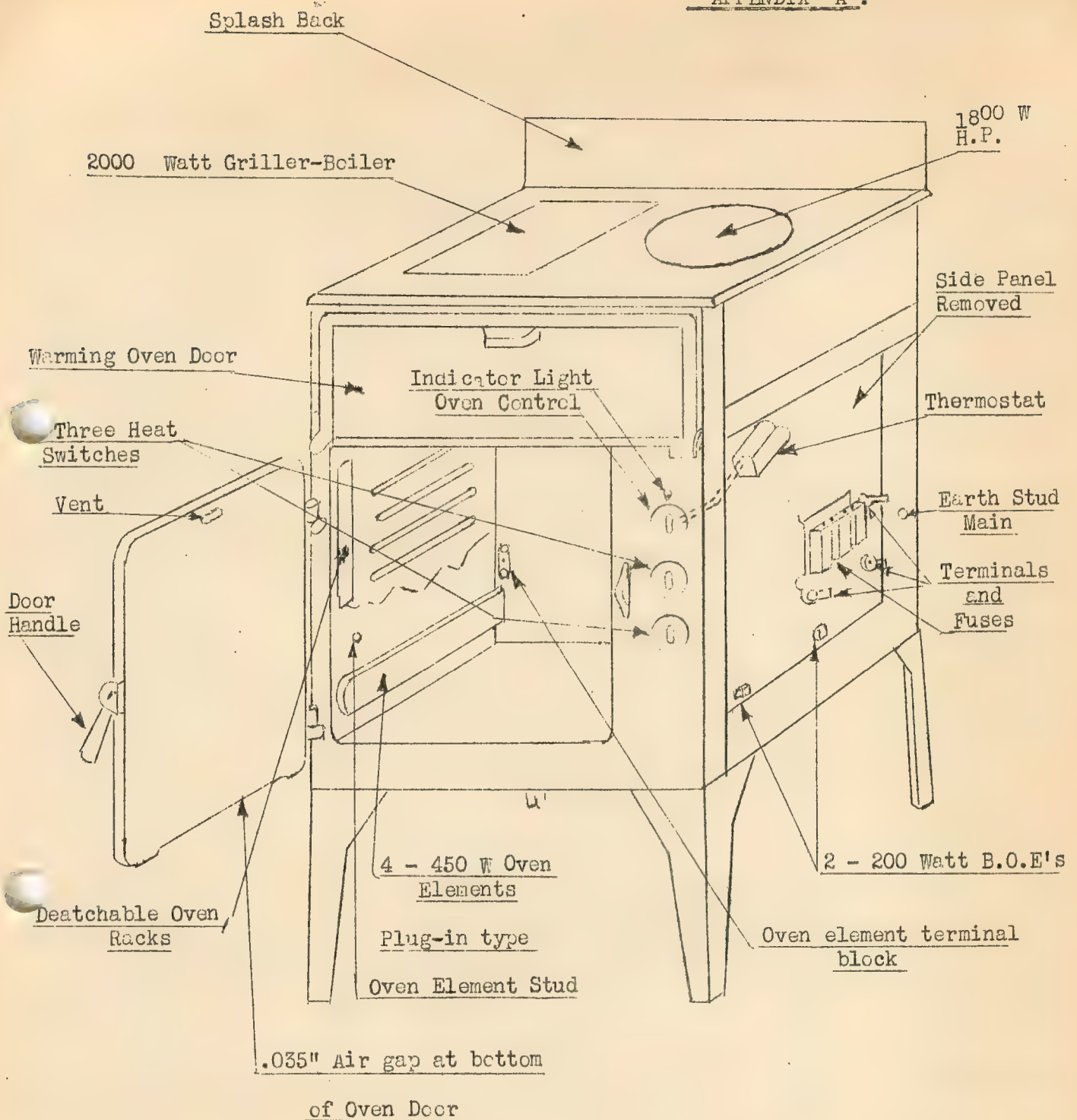
Each single-pole switch can be distinguished by its four terminals whilst the double-pole Arrow has five terminals.

8. Wiring.

The wiring is of 1/.064" asbestos cambric covered and is readily accessible for inspection, testing or replacement after removing the side panel, fibro panel and aluminium back panel.

The back panel may be detached by removing four 2BA x $\frac{1}{2}$ " stove screws.

APPENDIX "A".



LAYOUT OF "RITEMP" RANGE

ITEM NO.32 - "RITEMP" CAT. 2007V. 3-HOTPLATE RANGE.

1. Location of Fuses.

The four 15 amp. M.E.M. fuses are located behind the panel on the right hand side as shown in Appendix "A".

2. Lifting of Hob.

It is necessary to raise the hob to replace hotplates and detach side panels. The hob is hinged at the rear. To raise it:-

- (a) Detach splash back by lifting it from the locating holes in the rear of the hob.
- (b) Open warming oven door.
- (c) Loosen special No. OBA knurled head screw located under front edge of hob.
- (d) Raise the hob and support it with the hinged strap on the left hand side.

3. Removal of Side Panels.

The left and right hand side panels are not interchangeable. When removing the left hand side panel it is necessary to tilt the range on its edge to prevent the slag wool insulation from falling out.

It is necessary to remove the right hand side panel for connection or disconnection of range, replacement of fuses, bottom oven elements, 3-heat switches, "Simmerstat" pilot lamp, and replacement and adjustment of oven thermostat.

To remove the side panel:-

- (a) Remove splash back and raise hob.
- (b) Unscrew two 2BA X $\frac{1}{2}$ " stove screws from the back edge of the side panel.
- (c) Detach the panel. (The fuses will now be exposed).

To obtain access to the fuses, bottom oven elements, 3-heat switches, "Simmerstat", pilot lamp, oven thermostat and wiring, it is then necessary to remove the fibro panel. To do this, unfasten the two No.6 x $\frac{1}{2}$ " self-tapping screws located at the bottom and right side of panel.

4. 1800 W. and 1000 W. Cast Hotplates.

These hotplates are of the plug-in type using four $\frac{1}{4}$ " N.P. pins.

5. 2500 W. Grill-Boiler Hotplate.

This hotplate is also of the plug-in type using four $\frac{1}{4}$ " N.P. pins.

"Ritemp" 2007 V. 3-Hotplate
Range.

ITEM NO.32 - (CONT'D).

6. Oven Elements.

The oven assembly consists of four 450 watt side oven elements (two elements being located on each side of the oven interior.

These elements are of the plug-in type using two $\frac{1}{4}$ " diam. N.P. active and neutral pins and on $3/16$ " N.P. earth pin.

To remove a side oven element:-

- (a) Remove the baking dish and oven slides.
- (b) Remove enamelled detachable oven rack, by lifting rack and sliding forward.
- (c) Pull out the element assembly.
- (d) Unscrew the 2BA X $\frac{1}{2}$ " raised head screw securing the porcelain terminal block to the folded metal casing.
- (e) Slide the element assembly from the folded metal casing. This exposes for inspection, repair or replacement, the resistor, porcelain insulators, spacers, terminal block and two $\frac{1}{4}$ " diam. N.P. active and neutral pins and one $3/16$ " diam. N.P. earth pin.

To remove a bottom oven element:-

- (a) Remove the active fuses at the switchboard controlling the range circuit.
- (b) Remove the side panel and fibro asbestos panel.
- (c) Remove the 2BA x $\frac{1}{2}$ " stove screws and nuts securing aluminium angle bracket to base of range.
- (d) Disconnect conductors by removing 4BA hexagon nuts from terminal screws.
- (e) Disconnect earth wiring by removing 4BA x $5/16$ " R/H screw and nut from earth strip.
- (f) Withdraw element from oven sheath.

7. Control of 1800 W. Cast Hotplate.

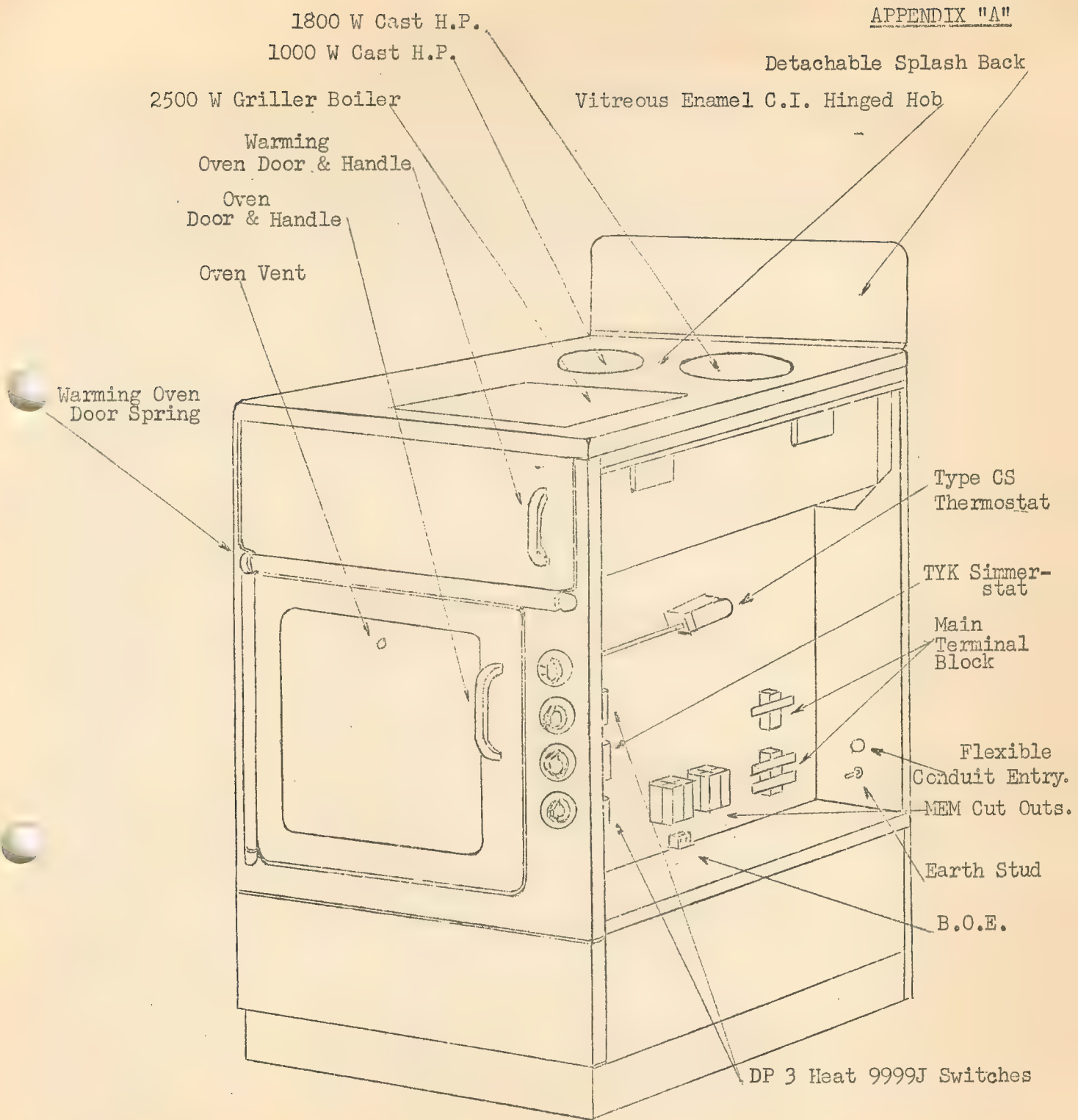
The 1800 W. cast hotplate is controlled by a "Sunvic" type TYK, 2500 W. "Simmerstat" fitted with white plastic knob identical in shape to that on the 3-heat switches and "Satchwell" thermostat. The knob markings are indicated in black letters and figures as follows:-

"LARGE PLATE", - "OFF", "ON", "FULL". The knob is calibrated in 21 divisions between markings "ON" and "5". For quick boiling, the knob should be turned to "FULL". When the "Simmerstat" is switched to "FULL" position there is no "cycling" action.

8. Wiring.

The wiring is readily accessible after removing the right side panel, fibro panel and back panel.

APPENDIX "A"



Rating Plate on rear panel.

"RITEMP" RANGE

MODEL 2007V

RATING 31 AMPS.

ITEM NO.33 - "SIMPSON" AND "ROWCO" MODEL NO.1 RANGES.

1. Manufacturer.

The original 2-hotplate range manufactured by A. Simpson & Son Ltd., Adelaide, was known as the Rowco No.1, and was distributed in Sydney by H. Rowe & Co. Pty. Ltd.

In 1947, this model was superseded by "Simpson" Model No.1.

2. Description.

The pre-war design of "Simpson" No.1 was fitted with 1750 W, and 600 W. Bray-ring hotplates. The post-war design is fitted with cast hotplates of either 8-11/16" diam. 1850 W. or 8" diam. 1800 W, and a 6 1/4" diam.1000W. cast hotplate.

This item will deal with the construction of the post-war model, Simpson No.1. Features by which this model differs from the Rowco No.1 are also detailed. (Refer paragraph 7).

3. Location of Fuses.

Fuses are located below the hob at the right hand side of the range.

4. Removal of Hob.

To remove the hob:-

- (a) Loosen the 1" x 1/4" RD/HD screw securing the hob to the front of the range.
- (b) Prise the hooked end of the 18" x 3/16" hinge rod clear of the rear of the range and withdraw the rod.
- (c) Lift up the hob.

5. Removal of Right Side Panel.

It is necessary to remove the side panel for replacement of 3-heat switches, switch panel, main terminal block, fuses, hotplate and oven element wiring, top and bottom oven element terminal rods, and tube and thimble insulators.

To remove the side panel:-

- (a) Raise the hob.
- (b) Remove the 1/2" x 3/16" RD/HD screw and nut located in the bottom centre of the right side panel.
- (c) Detach the panel by sliding upwards.

6. Wiring.

The wiring is of 1/.064" cambric asbestos covered "Rockbestos" or International Radio wire and is readily accessible for inspection, testing or replacement after raising the hob and removing the main terminal cover and side panel.

ITEM NO.33 (CONT'D).

7. Comparisons of "Simpson" No.1 and "Rowco" No.1 Ranges.

- (a) Design: The "Simpson" No.1 and "Rowco" No.1 ranges are similar in design.
- (b) Hotplates: The post-war model "Simpson" No.1 range is fitted with cast hotplates wired directly to the 3-heat switches, whereas the pre-war model "Rowco" No.1 is fitted with "Bray" ring hotplates wired to a black sindanyo terminal panel. The terminal panel is protected by either a black sindanyo or a folded metal cover.
- (c) Top Oven Elements: The top oven elements on the "Simpson" and "Rowco" No.1 ranges are rated at 240 V, 1600 W and are interchangeable.

The front resistor should always be in circuit with the switch on "MEDIUM".

- (d) Bottom Oven Elements: The bottom oven element on the "Simpson" No.1 range is rated 240 V, 100 W., whereas that on the pre-war "Rowco" No.1 range is rated 240 V, 150 W. However, the new replacement bottom oven element for the "Rowco" No.1 range, although of pre-war design, is rated at 240 V, 1000 W, and is interchangeable with the "Simpson" No.1 element.

The common pigtail connection on the "Simpson" No.1 bottom element is in the centre of the assembly, whereas on the "Rowco" No.1 is either at the front or back. In the case "Simpson" No.1 bottom element, the front resistor should always be in circuit with the switch on "MEDIUM".

If the bottom elements are interchanged, the asbestos conductor connected to terminal marked "M" on the 3-heat switch should always be connected to the common pigtail connection on the element.

In the case of a "Simpson" No.1 bottom element, the front resistor should always be in circuit with the switch or "MEDIUM".

- (e) Switches on "Rowco" No.1 Range: "Rowco" No.1 ranges were fitted with "Diamond" H 10 amp. single-pole 3-heat switches with white knobs. The standard replacement shall be the 10 amp. single-pole "Arrow" 9908J 3-heat switch.
- (f) Power Outlets: Some of the early model "Rowco" No.1 ranges not sold by the Council were fitted with a power outlet located at the rear of the switch panel above the 3-heat switch.

Side Hinged Hob & Splash back

APPENDIX "A".

1000 W Cast HP

4-15 Amp. Cut Outs

8"-1800W or 8-11/16" - 1850 W
Cast HP

Drip Tray

Door Handle
& Catch

HL.

Wiring
(Rockbestos)
.064" Dia.

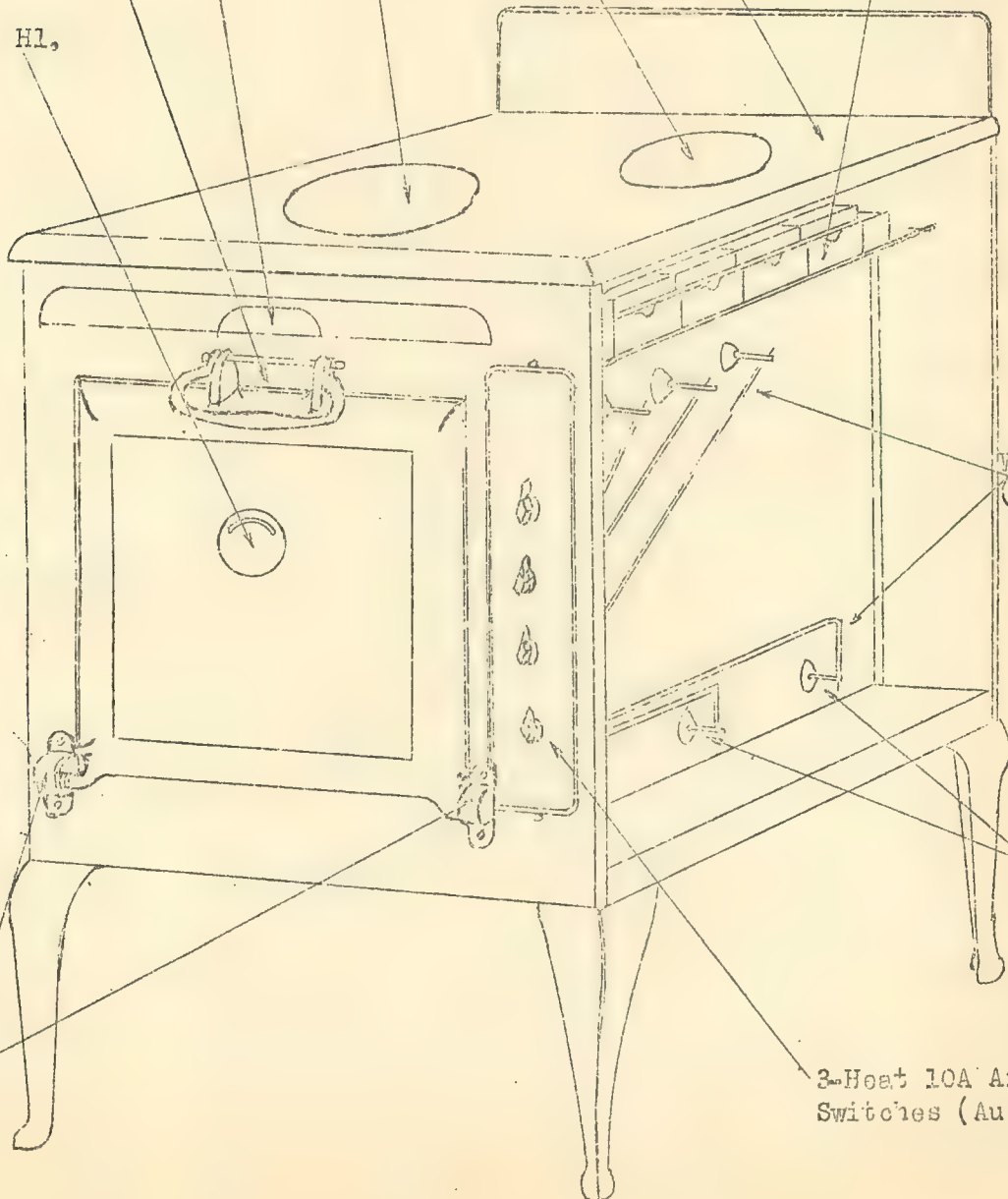
Thimble
Type
Terminal
Insulators

3-Heat 10A Arrow
Switches (Australian)

Hinge Covers, Door Springs & Pawls.

SIMPSON NO. 1 RANGE.

RATING 5.4 kW



ITEM NO.34 - "SIMPSON" AND "ROWCO" NO.2 MODEL 3-HOTPLATE RANGES.

1. Manufacturer.

The original 3-hotplate range manufactured by A. Simpson & Son Ltd., Adelaide, was known as Rowco No.2 and was distributed in Sydney by H. Rowe & Co. Pty. Ltd.

In 1947 this model was superseded by "Simpson" Model No.2 and is distributed in New South Wales by R.W. Winning & Son, Sydney.

2. Description.

The pre-war design of this model was fitted with 1750 W, 1200 W, and 600 W. Bray-ring hotplates. The post-war design is fitted with two 8" 1800 W. and one 6 $\frac{1}{4}$ " W cast hotplates, or 8" 1800 W, 6 $\frac{1}{4}$ " 1000 W, and 6 $\frac{1}{4}$ " 600 W. cast hotplates.

This item will deal with the construction of post-war model "Simpson" No.2 Features by which this model differs from the "Rowco" No.2 are also detailed. (Refer paragraph No.7).

3. Location of Fuses.

The fuses are located below the hob at the right side of the range.

4. Removal of Hob.

To remove the hob:-

- (a) Loosen the 1" x $\frac{1}{4}$ " RD/HD screw securing the hob to the front of the range.
- (b) Prise the hooked end of the 20" x 3/16" hinge rod clear of the rear of the range and withdraw the rod.
- (c) Lift up the hob.

5. Removal of Right Side Panel.

It is necessary to remove the side panel for replacement of 3-heat switches, switch panel, terminal panel, fuses, top and bottom oven element wiring, top and bottom oven element terminal rods, and tube and thimble insulators.

To remove the side panel:-

- (a) Remove the active fuses at the switchboard controlling the range circuit.
- (b) Raise the hob.
- (c) Remove the four 3/8" x 3/16" RD/HD screws and washers located on the right hand side and two 3/8" x 3/16" RD/HD screws, nuts, and washers located at the bottom of the panel.
- (d) Slide the panel to the right and detach from range.

ITEM NO.34 (CONT'D).

6. Removal of Bottom Oven Element Cover.

To remove a bottom oven element cover:-

- (a) Remove the two hinge covers and detach the oven door from the range.
- (b) Prise the folded front edge of the bottom oven element cover over the front edge of the range frame and slide the cover from the oven interior.

NOTE: The bottom oven cover should always be located under the lowest side racks of the oven interior, and the folded front edge should always fit in the slot provided between the range frame and oven interior.

7. Comparisons of "Simpson" No.2 and "Rowco" No.2 Ranges.

- (a) Design: The "Simpson" and "Rowco" No.2 Model Ranges are similar in design.
- (b) Top Oven Elements: Some of the later pre-war "Rowco" No.1 and No.2 model ranges were supplied with top oven elements fitted with four lugs (two spot welded to each side of the assembly). The element assembly is fastened to the top of the oven interior by sliding the four lugs through bracket spots welded to the top of the oven interior.
- (c) Bottom Oven Elements:
The bottom oven element on the "Simpson" No.2 Range is rated at 240 V, 1200 W, whereas that on the pre-war "Rowco" No.2 range is rated at 240 V. 1500 W. However, the new replacement bottom oven element for the Rowco No.2 range, although of pre-war design, is rated at 240 V, 1200 W., and is interchangeable with "Simpson" No.2 element. The common pigtail connection on the "Simpson" No.2 bottom oven element is in the centre of the assembly, whereas on the "Rowco" No.2 is either at the front or back.

The "Rowco" No.2 bottom oven element assembly frame is identical with that of the "Rowco" No.1 range.

If the bottom oven elements are interchanged, the asbestos conductor connected to terminal marked "M" on the 3-heat switch should always be connected to the common pigtail connection on the element.

In the case of a "Simpson" No.2 bottom oven element, the front resistor should always be in circuit with the switch on "MEDIUM".

Side Hinged Hob & Splash back

APPENDIX "A".

1000 W Cast HP

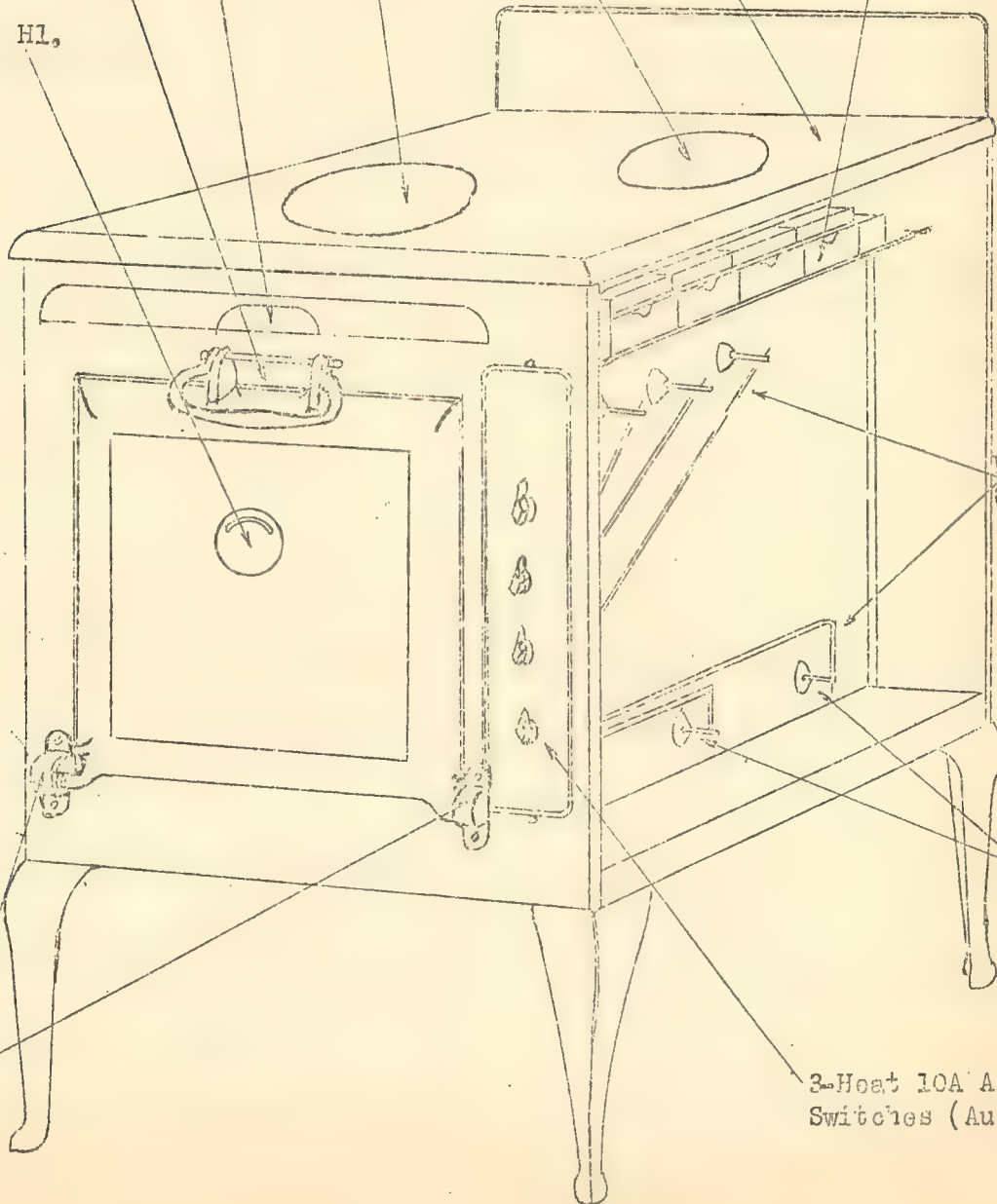
4-15 Amp. Cut Outs

8"-1800W or 8-11/16" - 1850 W
Cast HP

Drip Tray

Door Handle
& Catch

H1,



Wiring
(Rockbestos)
.064" Dia.

Thimble
Type
Terminal
Insulators

3-Heat 10A Arrow
Switches (Australian)

Hinge Covers, Door Springs & Pawls.

SIMPSON NO. 1 RANGE.

RATING 5.4 kW

ITEM NO.34 (CONT'D).

6. Removal of Bottom Oven Element Cover.

To remove a bottom oven element cover:-

- (a) Remove the two hinge covers and detach the oven door from the range.
- (b) Prise the folded front edge of the bottom oven element cover over the front edge of the range frame and slide the cover from the oven interior.

NOTE: The bottom oven cover should always be located under the lowest side racks of the oven interior, and the folded front edge should always fit in the slot provided between the range frame and oven interior.

7. Comparisons of "Simpson" No.2 and "Rowco" No.2 Ranges.

- (a) Design: The "Simpson" and "Rowco" No.2 Model Ranges are similar in design.
- (b) Top Oven Elements: Some of the later pre-war "Rowco" No.1 and No.2 model ranges were supplied with top oven elements fitted with four lugs (two spot welded to each side of the assembly). The element assembly is fastened to the top of the oven interior by sliding the four lugs through bracket spots welded to the top of the oven interior.
- (c) Bottom Oven Elements:

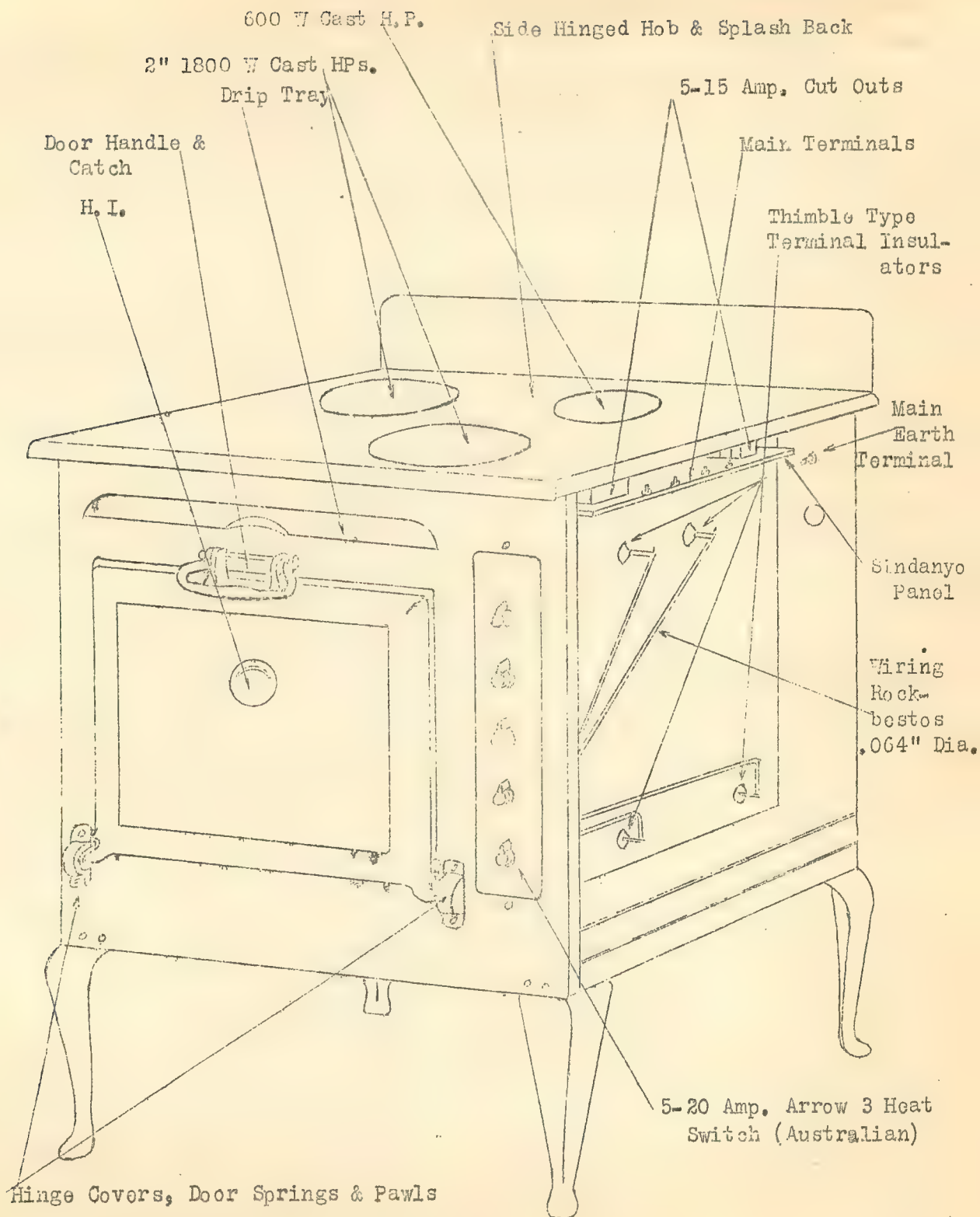
The bottom oven element on the "Simpson" No.2 Range is rated at 240 V, 1200 W, whereas that on the pre-war "Rowco" No.2 range is rated at 240 V. 1500 W. However, the new replacement bottom oven element for the Rowco No.2 range, although of pre-war design, is rated at 240 V, 1200 W., and is interchangeable with "Simpson" No.2 element. The common pigtail connection on the "Simpson" No.2 bottom oven element is in the centre of the assembly, whereas on the "Rowco" No.2 is either at the front or back.

The "Rowco" No.2 bottom oven element assembly frame is identical with that of the "Rowco" No.1 range.

If the bottom oven elements are interchanged, the asbestos conductor connected to terminal marked "M" on the 3-heat switch should always be connected to the common pigtail connection on the element.

In the case of a "Simpson" No.2 bottom oven element, the front resistor should always be in circuit with the switch on "MEDIUM".

APPENDIX A.



Vent in top RHS corner of rear of Oven Interior.

Namoplate on RHS panel.

"SIMPCON" NO. 2.
Rating 7.2 kW

ITEM NO.35 - SIMPSON TYPE E.9 2-HOTPLATE RANGE.

1. Location of Fuses.

The 15 amp. Federal fuses are located below the splash back.

2. Removal of Back Panel (Top and Bottom Sections).

It is necessary to remove the back panel for connection or disconnection of the range, replacement of switches, Simmerstat, bases of cut-outs, female sockets and steatite terminal block for top and bottom oven elements, and range wiring.

To remove the back panel (top and bottom sections):-

- (a) Remove 1" x 3/16" RD/H nickel plated screw located in top edge of splash back.
- (b) Remove $\frac{1}{4}$ " Whitworth brass nut securing top section of back panel to range and remove panel.
- (c) Remove No.10 x $\frac{1}{2}$ " self-tapping screw located at lower edge of bottom panel and remove panel.

3. Removal of Combined Hob and Splash Back.

It is necessary to remove the hob to replace fuses, hotplates and extension rods of switches and Simmerstat and to unfasten locknuts which secure switches and Simmerstat.

To remove the hob:-

- (a) Remove 1" x 3/16" RD/H nickel plated screw on top edge of splash back.
- (b) Raise back of hob and slide forward.

4. Oven Elements.

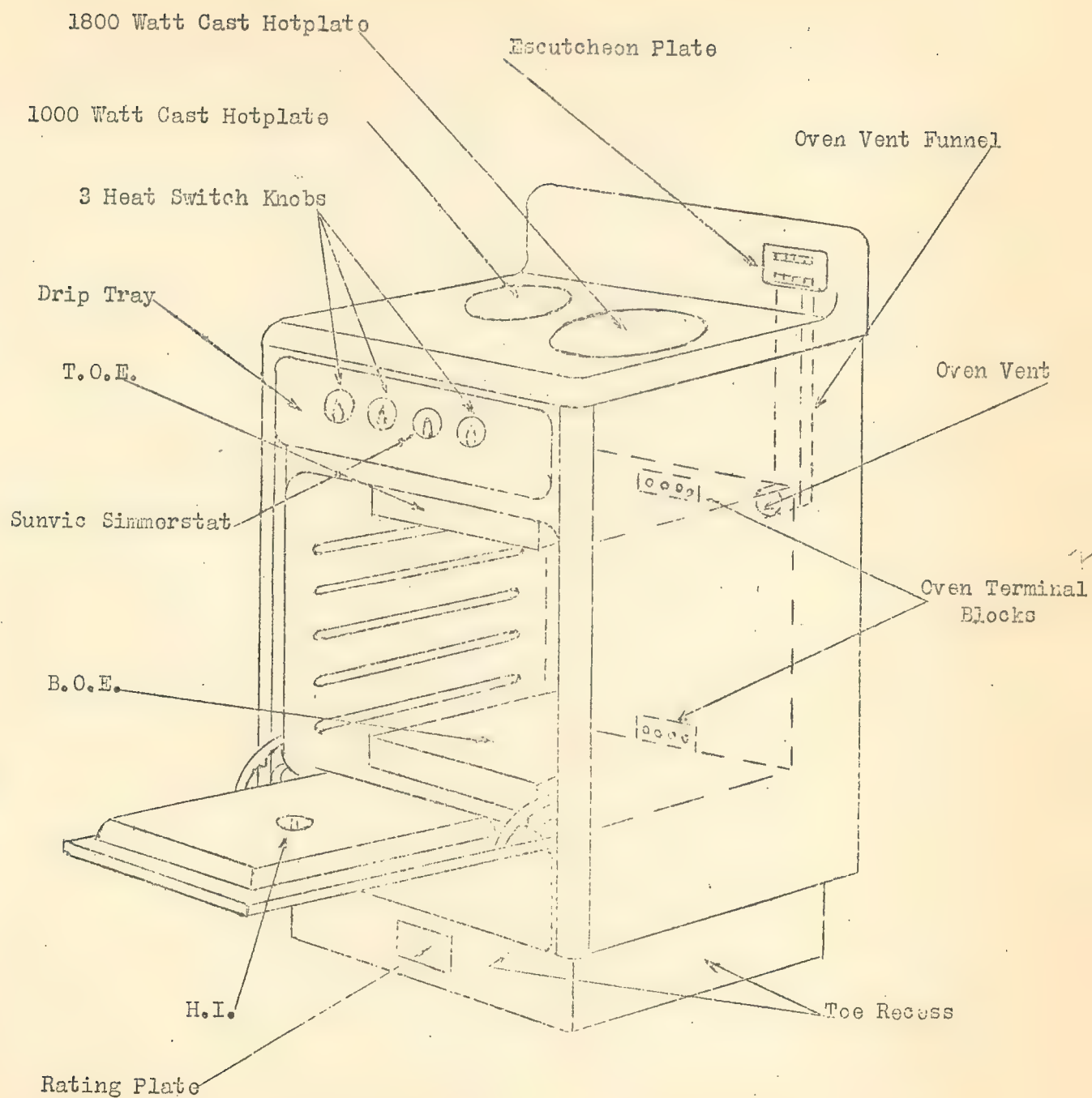
The top and bottom oven elements are of the plug-in type.

5. Wiring.

The range wiring is of 1/.064 cambric asbestos covered wire and is readily accessible for inspection, testing or replacement after removing the hob and the two back panels.

6. "Sunvic" Simmerstat.

A description of the "Sunvic" Simmerstat used to control the 1000 watt hotplate is contained in Item No.40.



SIMPSON E9.

ITEM NO.35 - SIMPSON TYPE E.9 2-HOTPLATE RANGE.

1. Location of Fuses.

The 15 amp. Federal fuses are located below the splash back.

2. Removal of Back Panel (Top and Bottom Sections).

It is necessary to remove the back panel for connection or disconnection of the range, replacement of switches, Simmerstat, bases of cut-outs, female sockets and steatite terminal block for top and bottom oven elements, and range wiring.

To remove the back panel (top and bottom sections):-

- (a) Remove 1" x 3/16" RD/H nickel plated screw located in top edge of splash back.
- (b) Remove 1/4" Whitworth brass nut securing top section of back panel to range and remove panel.
- (c) Remove No.10 x 1/2" self-tapping screw located at lower edge of bottom panel and remove panel. .

3. Removal of Combined Hob and Splash Back.

It is necessary to remove the hob to replace fuses, hotplates and extension rods of switches and Simmerstat and to unfasten locknuts which secure switches and Simmerstat.

To remove the hob:-

- (a) Remove 1" x 3/16" RD/H nickel plated screw on top edge of splash back.
- (b) Raise back of hob and slide forward.

4. Oven Elements.

The top and bottom oven elements are of the plug-in type.

5. Wiring.

The range wiring is of 1/.064 cambric asbestos covered wire and is readily accessible for inspection, testing or replacement after removing the hob and the two back panels.

6. "Sunvic" Simmerstat.

A description of the "Sunvic" Simmerstat used to control the 1000 watt hotplate is contained in Item No.40.

ITEM NO. 36. "SIMPSON TYPE E.7 3-HOTPLATE RANGE.

1. Manufacturer.

Since July 1948, Messrs. R.W. Winning & Son, Sydney, have supplied the Council with Type E.7 ranges produced by Messrs. A. Simpson & Son. Ltd. of Adelaide, South Australia.

2. Description.

The E.7 3-hotplate range is of similar construction to the E.9 2-hotplate range.

The E.7 has a larger oven, deeper hob etc., and has an additional 1800 watt hotplate.

The E.9 has been described in Item No. 35 which should be read in conjunction with this item.

3. Layout of Component Parts.

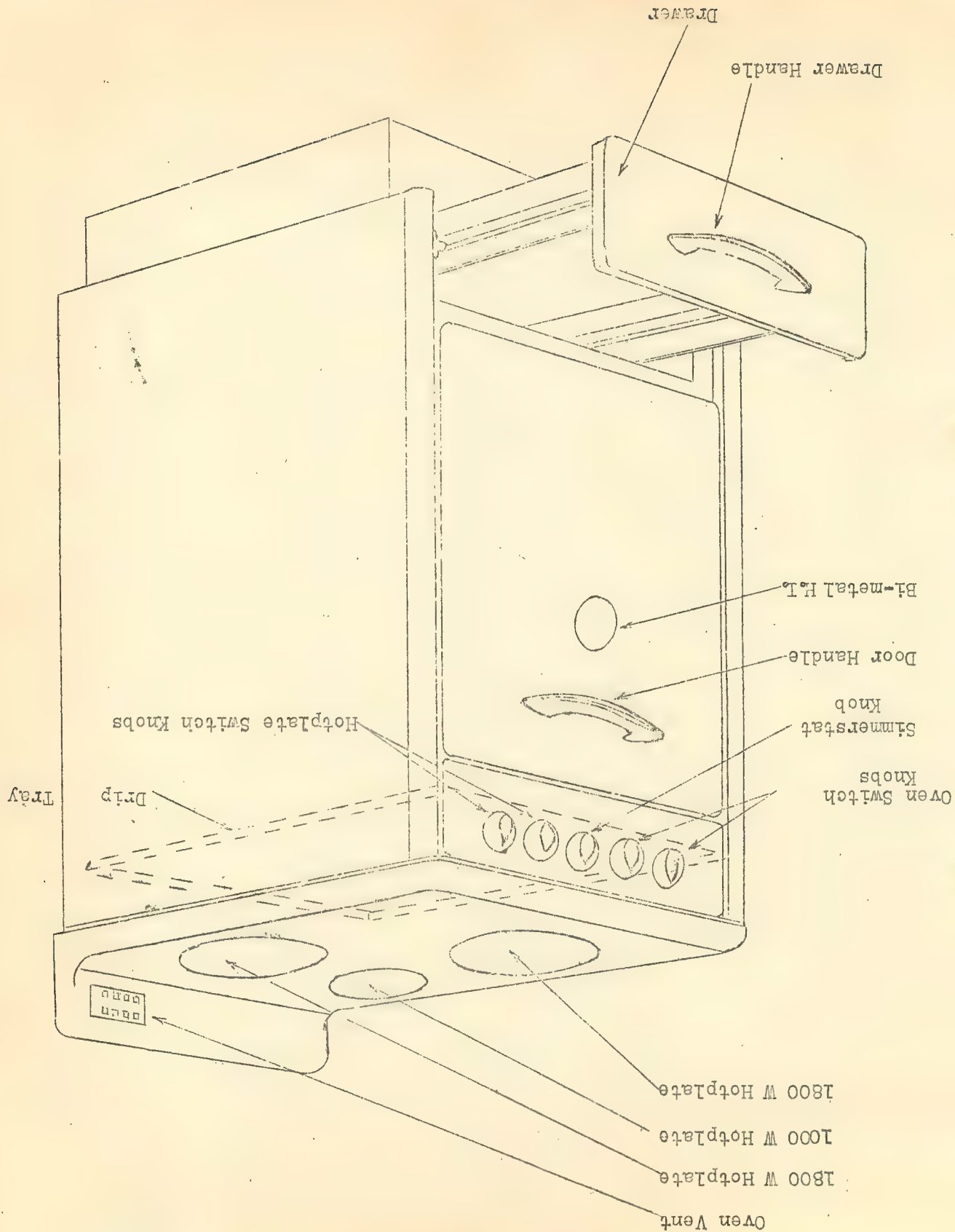
The layout of switches, hotplates etc. is detailed in Appendix "A" of this item.

4. Location of Rating Plate.

The rating plate, which includes the serial number is located in centre of sheet metal skirt forming the toe recess.

5. Location of Fuses.

The 15 amp. "Federal" cut-outs are located below the splash back.



ITEM NO.37 - ROWCO IO.2 RANGE.

1. Manufacturer.

Since November, 1945, Messrs. H. Rowe & Co., Sydney, have supplied the Council with type IO.2 ranges produced in their Sydney factory.

2. Description.

This type of range is recorded as Rowco IO.2 to distinguish it from Rowco No.1 and No.2 ranges made in Adelaide.

The letters IO denote "low oven", whilst the figure "2" indicates two hotplates.

3. Location of Fuses.

The four 15 amp. "Federal" fuses are located below the hob and beneath the splash back on the right hand side as shown in Appendix "A".

The fuse protecting the 600 watt hotplate also protects the power outlet.

4. Removal of Hob.

It is necessary to remove the hob for connection or disconnection of the range, replacement of fuses and hotplates and inspection of nameplate.

To remove the hob:-

- (a) Remove the drip tray.
- (b) Turn hob fastening clip beneath hotplate support through one-quarter of a turn to the right (do not alter position of wing nut).
- (c) Detach the hob.

The channel strip on the bottom of the hob is now visible and it may be found that the $\frac{1}{4}$ " nuts on the countersunk head screws spot welded to the hob are not tensioned firmly on the channel. Under no circumstances should these three nuts be tightened as the expansion during temperature changes is sufficient to cause the vitreous onanel on the face of the hob to chip above the head of the screw.

5. Removal of Hotplate.

To remove a cast hotplate -

- (a) Remove the hob.
- (b) Detach the cover plate over the wiring channel by unscrewing the self-tapping screw.
- (c) Disconnect the beaded leads at the terminals of the connectors.
- (d) Lift out the hotplate from the earth socket.

ROWCO 10.2 RANGE.ITEM NO.37 (CONT'D).6. Removal of 1800 Watt Top Oven Element.

To remove the top oven element:-

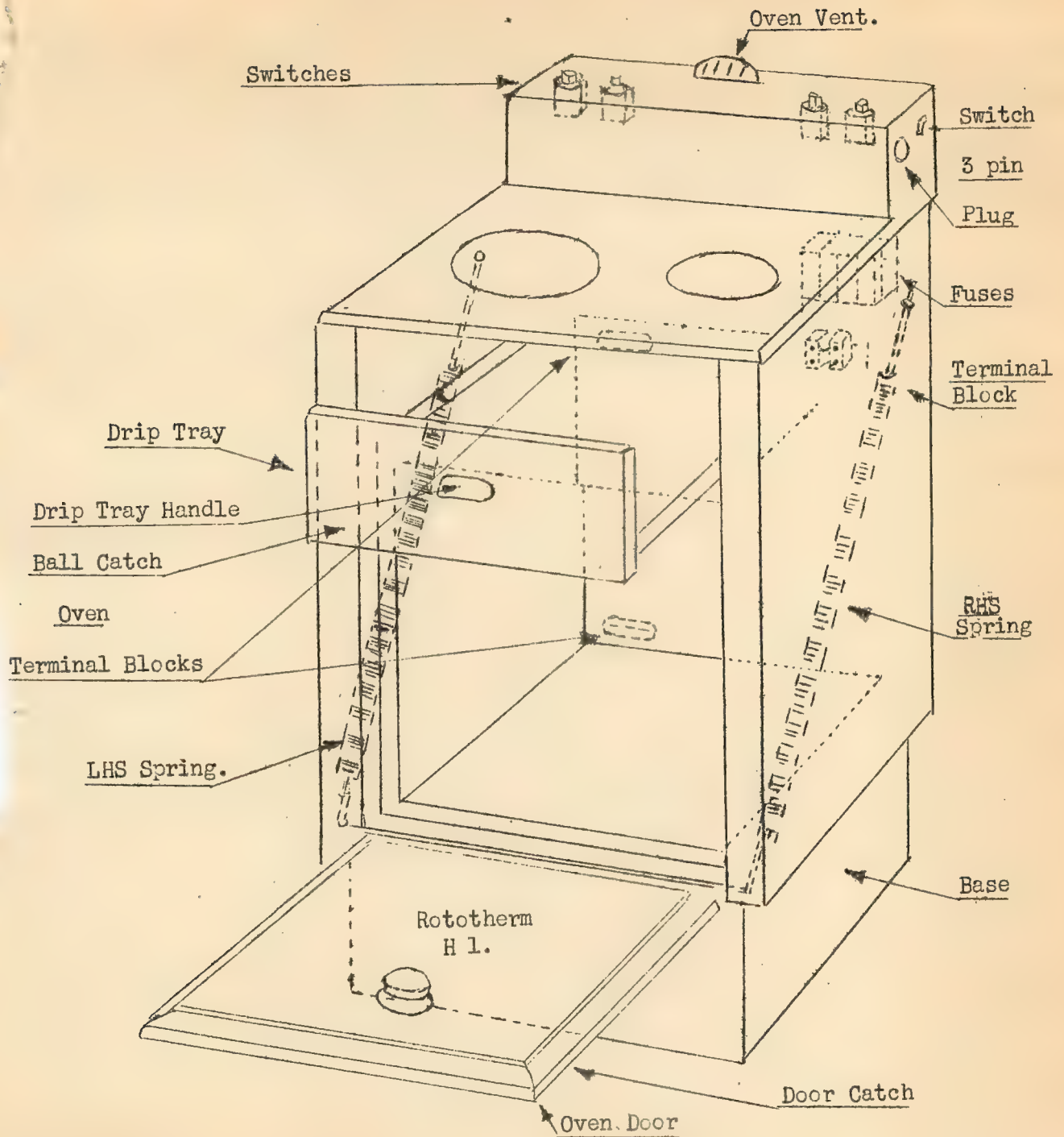
- (a) Isolate top oven element at fuse.
- (b) Unscrew two self-tapping screws from the monel strip attached to the top oven element guard.
- (c) Slide the guard from oven.
- (d) Disconnect the three beaded leads by rolling forward the $3\frac{1}{2}$ " x $3/16$ " flattened monel terminal rods and releasing the stranded end of each lead from the $7/64$ " diam. hole in the rod.
- (e) Slide out the top oven element with one hand whilst supporting its weight with the other.

7. Removal of 1300 Watt Bottom Oven Element.

To remove the bottom oven element:-

- (a) Isolate bottom oven element at the fuse.
- (b) Unscrew two self tapping screws from the front of the bottom oven element cover.
- (c) Lift out the vitreous enamelled bottom oven element cover.
- (d) Disconnect the three beaded leads by pulling forward the $3\frac{1}{2}$ " x $3/16$ " flattened monel terminal rods and releasing the stranded end of each lead from the $7/64$ " hole in the rod.
- (e) Slide out the bottom oven element.

LAYOUT OF ROWCO L02 RANGE.



ITEM NO.38 - "XCEL" MODEL K105/043 3-HOTPLATE RANGE.

1. Manufacturer.

The "Xcel" 3-hotplate range is manufactured in England by Elexcel Ltd. and distributed in Sydney by David Jones Ltd.

2. Location of Fuses.

The four (4) 15 amp. Dennis fuses are located behind the small panel (marked "fuses") which is detachable from the right-hand side panel.

3. Removal of Right Hand Side Panel.

It is necessary to remove the side panel for connection or disconnection of range, replacement of fuses and 3-heat switches and replacement or adjustment of oven thermostat.

4. Lifting of Hob.

- (a) Open griller door.
- (b) Remove $1\frac{1}{2}$ " x $\frac{1}{4}$ " C/SK head screw located under hob.
- (c) Raise hob and hold in position with hinged strap located at left hand side of range.

5. 2000 W. or 1200 W. B.T.H. Calrod Hotplates.

These hotplates are of the horizontal plug-in type using four (4) 3/16" N.P. pins.

To remove a hotplate:-

- (a) Lift the hob.
- (b) Firmly grip each side of the levelling bars located under hotplate, and pull dideways.
- (c) Remove 5/16" hexagon nut and lift cast cradle off calrod undercarriage.
- (d) Disconnect beaded conductors from three (3) active pins and bare earth conductor from earth.

6. 2000 W. Grill-Boiler Hotplate.

This hotplate is also of the horizontal plug-in type using four (4) 3/16" pins.

7. Side and Bottom Oven Elements.

The oven is heated by ten (10) 250 W. elements, three elements being located on each side of the oven interior, and four on the bottom. Each element consists of a mica strip $9\frac{1}{2}$ " x $1\frac{5}{8}$ " on which the element is wound with nichrome ribbon. The mica is strengthened by metal clips located between two supporting pieces of mica at each end of the element. Each element is connected to $\frac{3}{4}$ " x 3/32" tinned copper busbars at back and front of oven with 3/8" x 3/16" CH/HD nickel-plated screws and spring washers. The busbars are connected to three (3) $\frac{1}{4}$ " studs located in three (3) steatite bushings passing through the right hand side of oven interior.

Xcel 3-Hotplate Range.

2.

ITEM NO.38 (CONT'D).

To remove an oven element:-

- (a) Remove baking dish, browning tray and oven slides.
- (b) Remove enamelled side racks by lifting rack upwards.
- (c) Remove bottom cover by lifting slotted section at back of cover off two (2) 1" x 3/16" RD/HD screws located at back of oven interior.
- (d) Unscrew two (2) 3/8" x 3/16" CH/HD nickel-plated screws and remove defective element.

7. Oven Thermostat and Indicator Light.

The oven elements are automatically controlled by a Satchwell type C/S 15 amp. 250 volt thermostat fitted behind the side panel. This thermostat is operated by a white plastic knob located above the three 3-heat switches and is turned clockwise to raise the temperature. The control knob is calibrated from 200° to 550°F. in 15 calibrations and possesses an "OFF" position.

The 25 volt lamp located behind the control knob is connected in parallel with a shunt to indicate a red light when the elements are in circuit.

8. Switches.

Hotplates are controlled by 10 amp. 3-heat "Turnright" switches. "Arrow" type 9908J 3-heat single pole switches shall be used as the standard replacement.

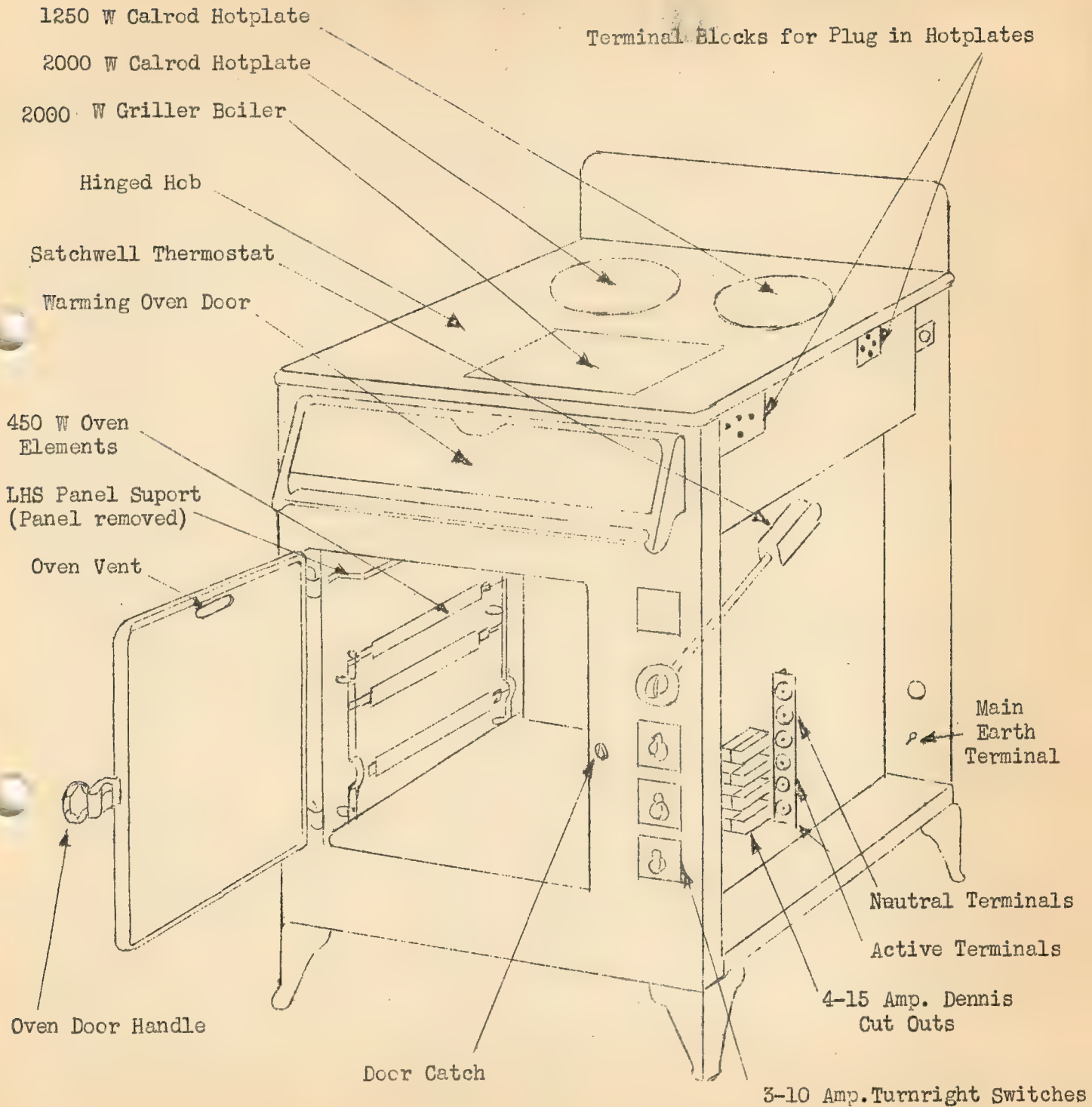
9. Wiring.

The wiring is of 1/.064 asbestos covered and is readily accessible for inspection, testing or replacement after removing the right and top left hand side detachable panels.

The three conductors to the left hand hotplate pass from the right to the left hand side of the range in a channel below the back of the hob. They may be replaced, without removal of the back panel, by feeding the conductors through the 3 holes in the porcelain bushing at the right hand side.

"XCEL" RANGE.

APPENDIX "A".



ITEM 39. "THERMENTOR" AUTOMATIC OVEN CONTROL.

1. Manufacturer.

Prior to 1940, Metters Ltd., fitted "Thermentor" automatic control as optional equipment to all their models of electric ranges. This "Thermentor" control was manufactured by Igranic Electric Co.Ltd., London, and many are still in service on the Council's supply:

2. Component Parts.

The "Thermentor" is contained in a metal case 5" x 5" x 2 $\frac{1}{4}$ " deep. It is normally mounted with the control knob above the pilot light and this item refers to Thermentors mounted on the left hand side of the oven.

When mounted on the right hand side of the oven, the control knob will be below the pilot light and the highest and lowest terminals and contacts will be the reverse of the positions detailed herein.

The unit is mounted on a brass frame and comprises the following main component parts :-

- (a) A control dial graduated in degrees F. from 200° to 500° or numbers from 1 to 12 covering the temperature range.
- (b) A rocker arm on which is mounted a nickel plated brass crossbar 2-3/16" long by 11/16" wide and $\frac{1}{8}$ " thick. The cross bar and its contacts are insulated from the rocker arm by mica washers and a bush. The crossbar carries the three movable contacts. The highest contact 3/16" diam. controls the pilot light, is fixed, but capable of individual adjustment against the spring loaded fixed contact.

The middle contact, having a face width of $\frac{1}{2}$ ", controls the bottom oven element, is not provided with any special adjustment and makes contact with the spring loaded fixed contact.

The lowest contact 5/16" diam., controls the top oven element, is spring loaded and capable of individual adjustment.

- (c) A steatite block containing the three fixed contacts. The highest contact is the spring loaded pilot control. The middle contact is heavily spring loaded for bottom oven element control, and the lowest contact is for top oven element control.
- (d) A pilot lamp 240 V. 15 watt miniature bayonet cap.
- (e) An "Invar" rod 3/16" diam., 14" long encased in a perforated aluminium sheath 13 $\frac{3}{4}$ " long.

3. Sequence of Operation.

The operation of the "Thermentor" when the oven is to be heated for roasting, baking and cooking with stored heat, is as follows :-

ITEM 39. (CONTD).

Thermentor Oven
Control.

3. (Contd).

- (a) The griller switch is switched to the position marked "Automatic".
- (b) The control dial is turned to the required temperature setting as indicated on the cooking chart.

The correct sequence of operations, as the dial is turned from the "OFF" position to the dial setting is as follows :-

- (i) When the dial is rotated in a clockwise direction through approximately 1", the highest contacts close. This completes the circuit to the pilot lamp and is indicated by a green light.
- (ii) When the dial is rotated a further $\frac{1}{2}$ ", the middle contacts close, energising the bottom oven element.
- (iii) When the dial is rotated a further $\frac{1}{2}$ ", the lowest contacts close, energising the top oven element and short circuiting the pilot lamp which goes out. When the oven reaches its predetermined temperature corresponding to the dial setting, the contacts for the top oven element separate; open circuiting the top oven element and simultaneously energising the pilot lamp. This is an indication that the oven has reached the required temperature.

The oven temperature continues to rise steadily because the bottom oven element is still energised. This should continue until the oven temperature rises a further 20 - 25°F. At this higher temperature the middle contacts part and the bottom oven element becomes open circuited. Thereafter, the bottom oven element cycles "ON" and "OFF". Any sudden drop in temperature, such as is caused by opening the oven door, will also cause the lowest contacts to close and energise the top oven element.

Throughout the cycle of operations during cooking, the pilot contacts remain closed and, provided the top oven element is open circuited, the pilot lamp will remain alight. It may happen that the oven door has been left open sufficiently long to cause the top oven element contacts to close. Under these conditions the pilot lamp will go out.

4. Defects in Igranic "Thermentors".

The defects likely to be encountered with Igranic "Thermentors" are detailed in Appendix "A". Adjustments to "Thermentors" will be made by the Electricity Sales Branch.

1. The first part of the paper discusses the importance of the study and the objectives of the research.

2. The second part of the paper describes the methodology used in the study, including the data collection and analysis techniques.

3. The third part of the paper presents the results of the study, which show that the proposed method is effective in solving the problem.

4. The fourth part of the paper discusses the conclusions of the study and the implications for future research.

5. The fifth part of the paper provides a summary of the findings and a final conclusion.

6. The sixth part of the paper discusses the limitations of the study and the need for further research.

7. The seventh part of the paper provides a list of references and a bibliography.

8. The eighth part of the paper provides a list of appendices and a bibliography.

DEFECTS IN IGRANIC THERMENTORS.

SYMPTOM	CAUSE.
Green pilot lamp fails to indicate	(a) Defective pilot lamp. (b) Open circuit in top oven element resistors and/or conductors.
Green pilot lamp fails to go out	Highest contact out of adjustment.
Thermentor fails to switch "on".	(a) Oven fuse open circuited. (b) Beaded active conductor between "line active" terminal conductor and crossbar open circuited.
Fails to switch "off" (automatically).	Fractured perforated aluminium sheath.
Oven temperature incorrect	Control dial out of adjustment.
Food burning at top	(a) Wrong sequence of operation. (b) Resistors of bottom oven element open circuited, half open circuited or intermittent in operation.

ITEM NO. 40. THE "SUNVIC" SIMMERSTAT, TYPES T.Y.C. AND T.Y.K.

1. Manufacturer.

The "Sunvic" Simmerstat is manufactured in England by Metropolitan Vickers for the distributors, Sunvic Controls Ltd., London. The representative in New South Wales is McKinlay Fletcher Pty.Ltd., Sydney.

2. General.

Many ranges are now connected to the Council's supply with hotplates controlled by "Sunvic" Simmerstats.

It is not anticipated that Emergency Service Officers will be required to carry out replacements or adjustments. Where a Simmerstat is found to be defective, the fuse for that hotplate circuit shall be removed. Repairs will be effected by the Electricity Sales Branch.

The "Simmerstat" was developed to replace the 3-heat and 4-heat switches and enable the range user to obtain a greater variation in hotplate control, for example, the lowest dial marking "0" provides for simmering, whilst variable heat control to full load is obtained by rotating the knob through 21 divisions between "0" and "5#". This variable heat control is obtained without any resistance losses.

3. Simmering of Foods.

Certain foods, such as thickened gravies and soups, etc. containing starchy substances, require to be cooked at the simmering temperature, approximately 180°F.

When too much heat is applied continuously to such foods after they have attained boiling point, the flour (a carbohydrate) used as the thickening agent will burn and form a black deposit on the base of the saucepan. By reducing the heat imparted by the hotplate to the bottom of the saucepan, the burning may be avoided by lifting the lid and occasionally stirring the liquid.

This process of stirring may be completely avoided by reducing the heat to a value which will allow circulation of the ingredients without burning or black deposit on the base. In fact, the food which has been simmered correctly will possess the correct thickness and flavour without the base of the saucepan being even discoloured.

The Simmerstat is capable of reducing the heat input to the saucepan sufficiently to produce the last named result. Customers who find the hotplate loading too high for simmering with a 3-heat switch may be advised to instal a Simmerstat which provides the desired lower heat input without losing the advantage of quick boiling where it entails a high speed hotplate.

1. The first part of the paper discusses the importance of the study and the objectives of the research. It also provides a brief overview of the methodology used in the study.

2. The second part of the paper discusses the results of the study and the findings of the research. It also provides a detailed analysis of the data collected during the study.

3. The third part of the paper discusses the conclusions of the study and the implications of the findings. It also provides a summary of the key points of the research and a final conclusion.

4. The fourth part of the paper discusses the limitations of the study and the areas for future research. It also provides a list of references and a bibliography of the sources used in the study.

5. The fifth part of the paper discusses the significance of the study and the impact of the findings. It also provides a final conclusion and a summary of the key points of the research.

6. The sixth part of the paper discusses the future of the study and the potential for further research. It also provides a list of references and a bibliography of the sources used in the study.

7. The seventh part of the paper discusses the overall findings of the study and the implications of the results. It also provides a final conclusion and a summary of the key points of the research.

8. The eighth part of the paper discusses the significance of the study and the impact of the findings. It also provides a final conclusion and a summary of the key points of the research.

ITEM NO. 40 (CONTD).

4. Description of the Simmerstat.

The Simmerstat is designed to fit into the space normally provided for the 3 or 4-heat switch. The overall dimensions of the bakelite case mounted behind the switch panel are $2\frac{1}{4}$ " x $2\frac{1}{4}$ " x 3" deep.

The spindle protrudes through a hole in the switch panel and two locating pegs are provided to engage in dimples in the panel to prevent the Simmerstat from twisting during rotation of the white plastic control knob. To remove the knob from the spindle, firmly grip the knob and pull off.

The calibrations between "0" and "5" on the knob are not intended to convey the temperature in degrees Fahrenheit. The knob is rotated clockwise to switch "ON" and increase the hotplate loading, and anti-clockwise to decrease the loading and switch "OFF".

Care should be taken not to rotate the knob anti-clockwise when in "OFF" position or clockwise when on markings "5" and "FULL" on types T.Y.C. and T.Y.K. respectively.

The standard Simmerstat is suitable without alteration for any type of boiling plate rated up to 2500 watts, 250 V. A.C., except transformer operated plates. It is not suitable for D.C. operation.

5. The Principle of the Simmerstat.

The Simmerstat is fundamentally an energy regulator and operates by opening a snap action switch in the hotplate circuit at short definite intervals. For example, on marking "1", which is a typical simmering position, the cycling period is 8 seconds "ON" and 37 seconds "OFF", equivalent to approximately 18% of the full load of the hotplate.

The proportion of time "ON" to time "OFF" is varied by turning the Simmerstat knob. In this way, the average power input is regulated at any desired level from zero to the full load of the hotplate.

Typical cycling periods are detailed in Appendix A of this Item.

IMPORTANT. The Simmerstat control regulates power input and not temperature. It is not intended for the control of ovens and therefore must not be confused with the principle of operation of the thermostat.

6. Construction.

The construction of the Simmerstat consists of a steatite base on which are mounted three brass strips on each of which is fitted one terminal for connection to hotplate wiring. The strips marked "L" and "G" on the original Simmerstats (type T.Y.) were of brass 1/16" thick, whilst those on later models (types T.Y.C. and T.Y.K.) are of brass 3/32" thick. The increase in thickness was found necessary by the manufacturers to overcome the variation caused to the adjustment when excessive pressure was placed on the strips whilst tightening the terminal screws.

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is a summary of the work done and the results obtained. It is a general statement of the work done and the results obtained.

2. The second part of the report deals with the work done during the year.

3. The third part of the report deals with the work done during the year.

4. The fourth part of the report deals with the work done during the year.

5. The fifth part of the report deals with the work done during the year.

6. The sixth part of the report deals with the work done during the year.

7. The seventh part of the report deals with the work done during the year.

8. The eighth part of the report deals with the work done during the year.

9. The ninth part of the report deals with the work done during the year.

10. The tenth part of the report deals with the work done during the year.

11. The eleventh part of the report deals with the work done during the year.

12. The twelfth part of the report deals with the work done during the year.

13. The thirteenth part of the report deals with the work done during the year.

ITEM NO. 40 (CONTD).

6. (Contd).

The heating coil of 48 S.W.G. nichrome wire on the bi-metal strip has a resistance of 5500 ohms and is electrically connected to the strips marked "R.L." and "G". The fixed contact of the micro switch is riveted to the strip marked "L" whilst the movable contact is riveted to the long member of the one-piece beryllium copper spring. The opposite end of the long member is riveted to the brass strip marked "g". The two shorter compression members of the spring rest in special "v" shaped slots cut in a brass cradle.

A 3/16" diam. spindle is bushed through the steatite block and carries a moulded bakelite cam, the side of which presses against a pin riveted to a lug on the movable bracket. This bracket is pivoted on a special pin fastened to the steatite base with a slotted brass nut. The pin passes through a steel block on opposite faces of which is spot welded the bi-metal strip and a steel fulcrum strip. The zero adjusting screw is located on the movable bracket and provides the adjustment on the movement of the bi-metal strip. A punched out pointer on the free end of the fulcrum strip bears upon the long member of the micro switch close to its point of support.

The following adjustment screws are provided:-

- (a) Zero adjustment screw
- (b) Micro³/₈ gap adjustment screw
- (c) Cheese-head stop screw to prevent fulcrum strip from exerting excessive pressure on long member of micro switch.

7. Operating Principle.

When the Simmerstat is turned to the "ON" position, the contacts on the micro switch are closed. This completes the circuit through the heater coil and hotplate.

The heating coil is wound directly over the bi-metal strip and insulated from it by a thin layer of mica. When the coil is heated the bi-metal strip moves away from the brass strip marked "G", eventually coming in contact with the inner end of the zero adjustment screw. As the heating continues the bi-metal strip curves towards the brass strip marked "G". As this strip is spot welded to one face of the steel block it causes the block to rotate towards "G" and because the steel fulcrum strip is spot welded to the opposite face of the steel block, the steel fulcrum strip is caused to move towards "G". This results in a pressure being exerted on the long tension member of the micro-switch.

This cantilever force overcomes the vertical force supplied by the two compression members and the free end of the long member snaps the movable contact from the fixed contact with a quick action. The travel of the movable contact is limited by the micro gap adjustment screw.

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part of the report deals with the results of the work during the year and the progress of the work during the year.

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7. The seventh part of the report deals with the results of the work during the year and the progress of the work during the year.

ITEM NO. 40 (CONTL).

7. (Contd).

When the micro switch contacts open, the heating coil and hotplate circuits are open circuited. This action allows the heating coil to cool off and the pressure to be released from the bi-metal strip at its point of contact with the zero adjustment screws.

The curvature is lessened on the bi-metal strip causing the steel fulcrum strip to move away from "G". This removes the pressure on the long tension member of the micro switch and permits the contacts to close with a snap action. The Simmerstat will continue to cycle at positive intervals while the setting determined by the control knob remains unchanged.

By rotating the knob clockwise, the pressure exerted by the cam on the pin riveted to the movable arm is gradually released. This action eases the pressure between the bi-metal strip and zero adjusting screw resulting in the bi-metal strip having a greater distance to travel thus increasing the period in the "ON" position and in consequence increasing the equivalent hotplate loading. As the pressure is eased from the bi-metal strip, the period in the "OFF" position is reduced.

By rotating the knob anti-clockwise, the pressure exerted by the cam on the pin riveted to the movable arm is gradually increased. This action increases the pressure between the bi-metal strip and zero adjusting screw resulting in the bi-metal strip having a lesser distance to travel thus decreasing the period in the "OFF" position and in consequence decreasing the equivalent hotplate loading. As the pressure is increased on the bi-metal strip, the period in the "OFF" position is increased.

8. Wiring.

Appendices are attached to explain the cycling periods and the connections necessary for types T.Y.C. and T.Y.K. Simmerstats.

APPENDIX "A"

CYCLING PERIODS ON "SUNVIC" SIMMERSTAT. TYPE T.Y.C.

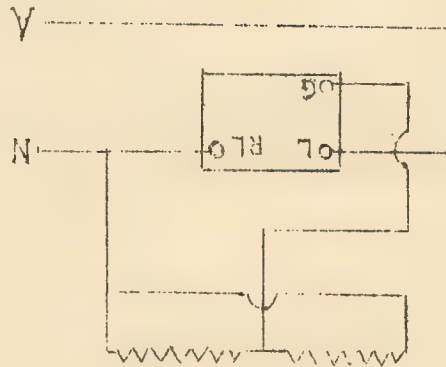
Marking	Seconds on	Seconds Off	Equivalent energy Input for 1800 W.	Equivalent energy Input for 1000 W.
0	6	61	161 Joules	89 Joules
$\frac{1}{2}$	7	34	307 "	171 "
1	8	37	320 "	178 "
$1\frac{1}{2}$	8	36	327 "	182 "
2	9	34	377 "	209 "
$2\frac{1}{2}$	10	26	500 "	278 "
3	11	28	508 "	282 "
$3\frac{1}{2}$	14	20	741 "	412 "
4	20	14	1,059 "	588 "
$4\frac{1}{2}$	92	8	1,656 "	920 "
5	-	-	1,800 "	1,000 "

CYCLING PERIODS ON "SUNVIC" SIMMERSTAT. TYPE T.Y.K.

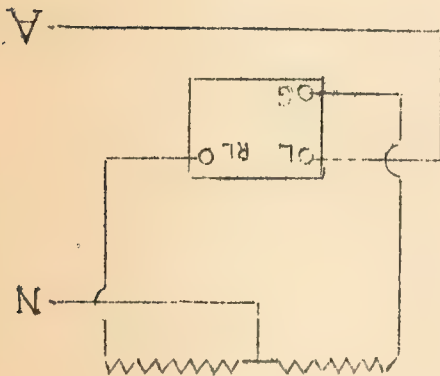
Marking	Seconds on	Seconds Off	Equivalent energy Input using 900 W.	Equivalent energy Input using 500 W. resistor of 1800 W. Hotplate
"ON"	7	68	84 Joules	47 Joules
$\frac{1}{2}$	7	50	112 "	61 "
1	7	40	134 "	74 "
$1\frac{1}{2}$	7	38	140 "	78 "
2	8	32	180 "	100 "
$2\frac{1}{2}$	7	27	185 "	103 "
3	8	27	206 "	114 "
$3\frac{1}{2}$	9	26	231 "	129 "
4	11	19	330 "	183 "
$4\frac{1}{2}$	13	15	418 "	232 "
5	34	10	695 "	386 "
"FULL"	-	-	1,800 "	1,000 "

SIMMERSTAT CONNECTIONS.

TYC SIMMERSTAT.



TYK SIMMERSTAT



ITEM NO. 41 "ELECTRICE" MODEL 3EL RANGE.

1. MANUFACTURER.

"Electrice" ranges are supplied by New System Telephones Pty. Ltd. and produced by the Electricity Manufacturing Co. Pty. Ltd.

2. DESCRIPTION.

The "Electrice" Model 3EL is an elevated oven type range of pressed steel construction. The range is manufactured in both right-hand (standard) oven and left-hand (special) oven models. In both models the oven is thermostatically controlled.

3. LAYOUT OF COMPONENT PARTS.

The layout of component parts is shown in Appendix "A".

4. LOCATION OF FUSES.

Fuses are accessible by lifting the hob.

5. LIFTING OF HOB.

The pressed sheet steel hob which incorporates the splash-back is hinged at the rear.

6. HOTPLATES.

Cast hotplates supported independent of the hob. Plug-in connections.

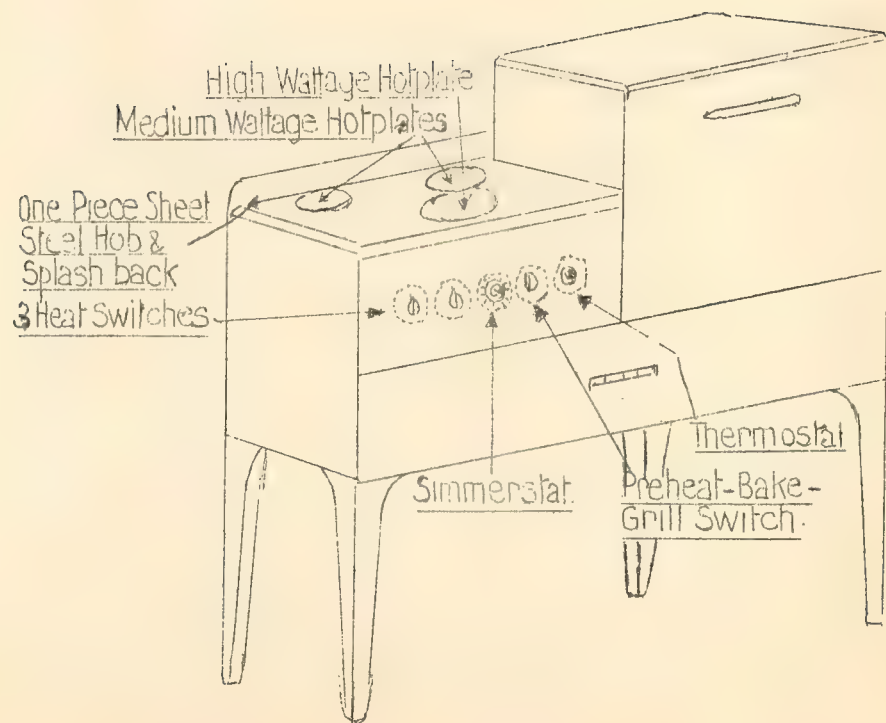
One 1800 W, 8" diam, with 3-heat switch control.

Two 1000 W, 6 $\frac{1}{4}$ " diam, with 3-heat switch control for left plate and "Stimmerstat" control for right plate.

7. OVEN ELEMENTS.

The oven elements are of the plug-in type. Top 2200 W, bottom 1400 W. The oven is thermostatically controlled. To "set" the oven, the "preheat - bake - grill" selector switch is turned to "preheat" and the thermostat to the required temperature. When this temperature has been reached the indicator light above the thermostat will go out. The selector switch is then turned to "bake", which cuts out the top element and leaves the bottom element only in.

"ELECTRICE" MODEL 3EL



ITEM NO. 42. "SIMPSON" MODEL E6 RANGE.

1. MANUFACTURER.

"Simpson" Model E6, 4-hotplate electric range is produced by A.Simpson & Co.Ltd., Adelaide, South Australia.

2. DESCRIPTION.

The range is a stream-lined table-top model of sheet metal construction with detachable side panels.

A hot drawer and two storage drawers are provided.

3. LAYOUT OF COMPONENT PARTS.

The layout of component parts is shown in Appendix "A".

4. LOCATION OF RATING PLATE.

The rating plate is located on the front of the plinth adjacent to the hot drawer switch.

5. LOCATION OF FUSES.

The fuses are located under the hob at the rear.

6. REMOVAL OF HOB.

The hob is a heavy gauge steel pressing, removable by loosening the screw on the top of the splash back and sliding the hob forward.

7. HOTPLATES.

Cast hotplates, supported independently of hob. Nut and bolt connections to terminals on back of hotplate. Plug-in type earth connections.

Two 1800 W, 8" diam. with 3-heat control.

Two 1000 W, 6 $\frac{1}{4}$ " diam. with "Simmerstat" control on the back left hotplate and 3-heat switch control on the front right.

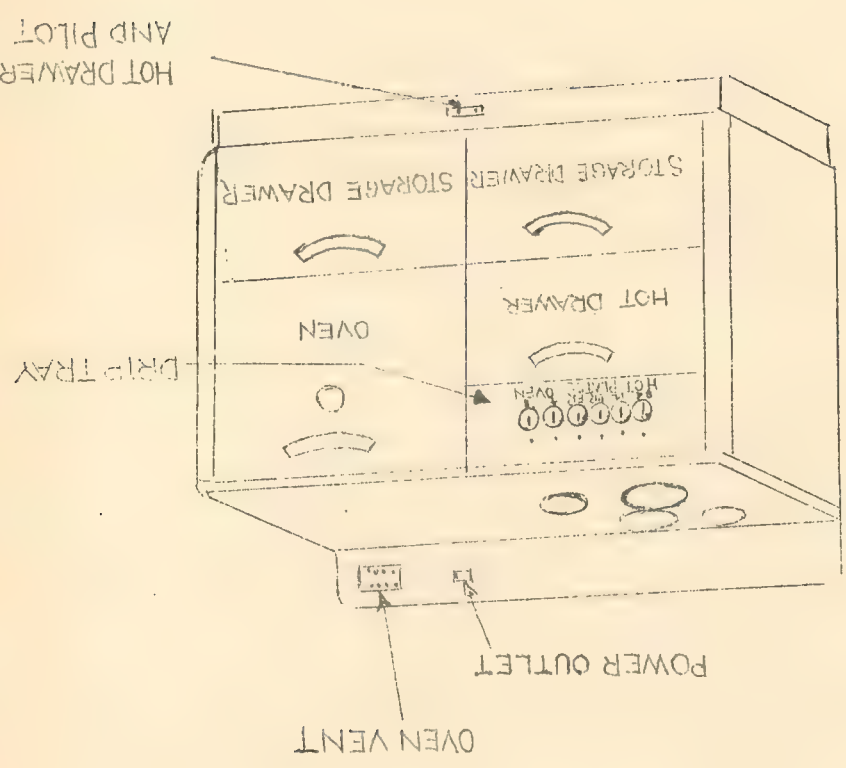
8. OVEN ELEMENTS.

The oven elements are of the plug-in type and controlled by 3-heat switches. Top 2750W, bottom 1400 W.

9. HOT DRAWER.

The hot drawer is fitted with a 750 W element controlled by an on-off switch incorporating a pilot lamp located in the centre of the front of the plinth.

" SIMPSON " MODEL E6



ITEM NO. 43 METTERS "EARLY KOOKA" MODEL EKL3 RANGE.

1. MANUFACTURER.

Metters "Early Kooka" ranges are manufactured in Sydney by Metters Ltd.

2. DESCRIPTION.

Model EKL3 range is a 3-hotplate, low oven model built of sheet steel.

3. LAYOUT OF COMPONENT PARTS.

The layout of component parts is shown in Appendix "A".

4. LOCATION OF FUSES.

The fuses are located behind the front of the drip tray.

5. HOB AND SPLASH BACK.

The splash back is incorporated in the hob which is detachable by removing the two nameplate screws. The join between the hob and the splash back is concealed by means of a chromium plated metal strip.

6. HOTPLATES.

One 1600 W, 8" diam. radiant tubular sheathed hotplate with 3-heat switch control.

One 1200 W, 8" diam. cast hotplate with Simmerstat control.

One 600 W, 6 $\frac{1}{4}$ " diam. cast hotplate with 3-heat switch control.

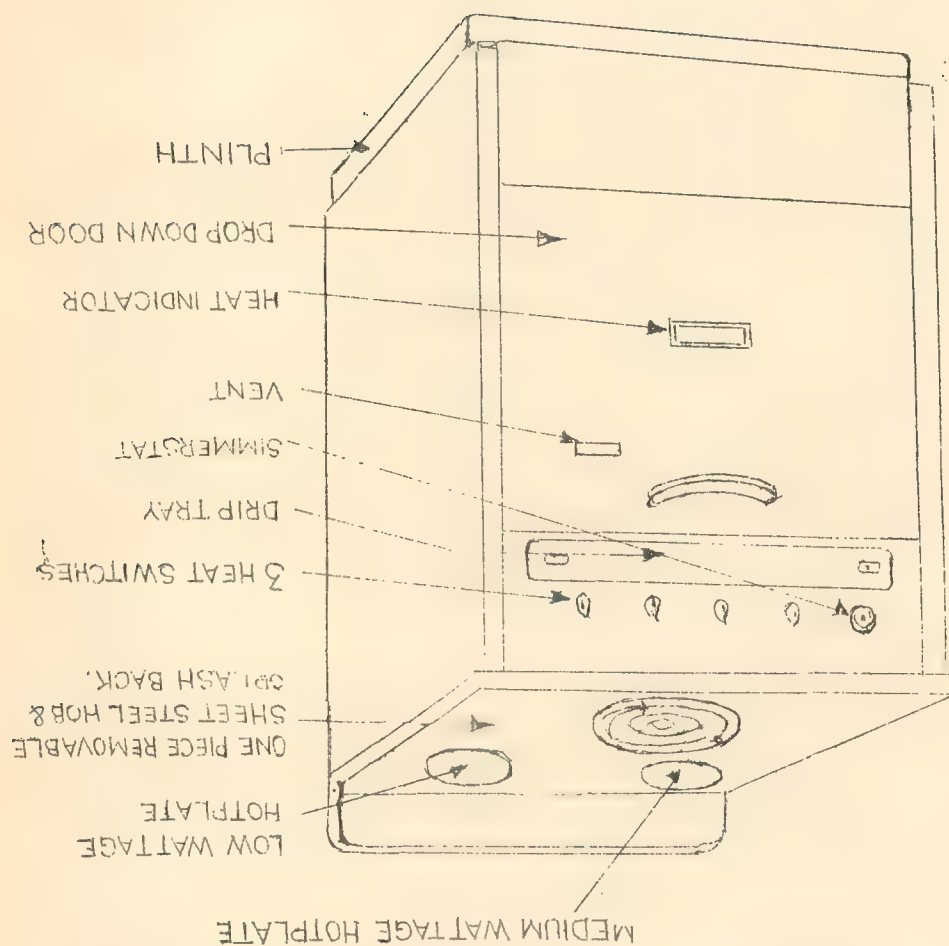
Connections by pigtaills connected to terminal housed in terminal box at front, under hob. Plug-in earth for cast hotplates. Nut and bolt connection to earth terminal for radiant hotplate.

7. OVEN ELEMENTS.

The oven elements are of the plug-in type controlled by 3-heat switches.

Top 2250 W, bottom 1500 W.

METTERS "EARLY KOOKA" MODEL EKL3



SECTION 2.

ITEM NO. 44 "ENGLISH ELECTRIC" CAST STREAMLINED RANGES. (Upright Cabinet 3-Hotplate Models).

1. GENERAL CONSTRUCTION - Cast frame with sheet metal panels.
2. FINISH - Vitreous enamel. Plastic switch knobs and door handles.
Mottled vitreous enamel interior.
3. HOB - Cast, hinged at rear and secured in front behind griller compartment door with knurled thumb screw. Remove splash back (Model 2009D or fascia panel (Model 2011) before raising hob. (Fig. 2.)
4. FUSES - Accessible by lifting hob and removing fuse cover at rear (Fig. 2.)
5. MAIN TERMINALS - Behind right-hand side panel (Fig. 3.)
6. HOTPLATES - Cast or radiant, plug-in type with earth pin (Fig. 2.)
Griller-hotplate, cast, plug-in type with earth pin (Fig. 2.)
7. OVEN ELEMENTS - Two separate elements on each side. Plug-in type with earth pin. Accessible by removing oven side baffles (Fig. 4.) Two separate bottom oven elements with nut and bolt connections. Accessible by removing right-hand side panel (Fig. 3.)
8. SWITCHES, "SIMMERSTATS", AND THERMOSTATS - Behind right-hand side panel (Fig. 3.)
9. OVEN TIMERS, MINUTE TIMER, PILOT LAMP FOR HOTPLATES, AND FLUORESCENT HOB LIGHT - fitted to 2011 models only. Fig. 1 shows front view of fascia panel. Fig. 5 shows rear view with back panel removed.
10. OVEN VENT - Through front of door at the top of the observation panel.
11. OVEN DOOR - Side opening.
12. WIRING - 1/.064" asbestos covered wire. Accessible after removing side and back panels (Figs. 3 and 5.) Wiring diagram (Fig. 6.)
13. OTHER FEATURES - Separate grilling compartment. Cast door frame. Oven baffles removable for cleaning. The 2009D models are fitted with detachable splash back.

To operate the oven and to cover the sockets at rear of range on 2011 models with fascia panel removed, it is necessary to insert a short circuiting plug in the sockets.

SECTION 2.

ITEM NO. 45 - ST. GEORGE "MASTER RANGE" - TABLE TOP 4 HOTPLATE MODEL.

1. General Construction - Streamlined sheet metal.
2. Finish - Vitreous enamel. Switch knobs plastic with chrome surround. Chrome handles and trims. Mottled vitreous enamel interior.
3. Hob - Heavy gauge steel pressing, permanent fixture with detachable section around hotplates, Fig. 2.
4. Fuses - Located under left hand side utility drawer, Fig. 3.
5. Main Terminals - At rear. Accessible by removing recessed cover in back panel, Fig. 4.
6. Hotplates - Radiant or Cast, plug-in type. Earthed centre pin. Fig. 2.
7. Oven Elements - Plug-in connections with earth screw, Fig. 5.

Master Oven - top and bottom elements controlled by automatic timer, thermostat, and individual 3-heat control.

Left Hand Oven - bottom oven element thermostatically controlled only.

Top Oven Element - to remove, detach wire guard by **unscrewing** four screws securing guard to top of oven; remove earthing screw from front of element, drop front of element clear of recess and withdraw by pulling forward.

NOTE: Where front of wire guard is secured to brackets, it is necessary to bend the brackets slightly outwards to permit front of element to clear the brackets before removal. Excessive bending which may break the brackets off should be avoided.

When replacing wire guards where brackets are fitted, ensure that rear of guard is located under brackets and clear of oven element terminals. Secure guard to rear brackets with self-tapping screws and washers, and front of guard to brackets with metal thread screws and washers only. Earthing is provided by stainless steel strip welded to mild steel front bracket.

Bottom Oven Elements - to remove, first remove bottom baffle cover after unscrewing securing screw and disconnecting adjacent earth strip; remove earthing screw from front of element, lift front of element clear of recess and withdraw by pulling forward.

SECTION 2.

ITEM NO. 46 - "McILWRAI" RANGE - 3 HOTPLATE UPRIGHT CABINET.

1. General Construction - streamlined sheet metal.
2. Finish - Vitreous enamel. Plastic switch knobs and handles. Mottled vitreous enamel interior.
3. Hob - Heavy gauge sheet steel pressing; removable by unscrewing two self-tapping screws from brackets under the front of hob, lifting front of hob clear of hotplates sliding back to clear two brackets at rear of range. Fig. 2 shows hob removed exposing brackets on each side of switches. NOTE: On some models where the front brackets are located behind fold in front of hob, it is necessary to remove the front securing screws and the brackets at rear of range before hob can be detached.
4. Fuses - Behind switch panel at front. Accessible by removing drip tray as shown in Fig. 2.
5. Main Terminals - At rear, accessible by removing cover. Fig. 4.
6. Hotplates - Pigtail connections to porcelain terminal blocks located below hob. Plug-in earth with locating pin on cast hotplates, radiant hotplates secured with 5/16" dia. stud and nut to support bracket. To replace hotplates, remove hob. Fig. 2.
7. Oven Elements - Top and bottom plug-in connection, thermostatically controlled. Fig. 3.
Top Oven Element - To remove, unscrew two self-tapping screws located on each side of front of element and pull forward.
Bottom Oven Element - To remove, unscrew two self-tapping screws from front of element cover, and detach cover by pulling forward to disengage earth pin from socket. Remove element by repeating procedure as detailed for top oven element.
8. Switches and Thermostat, etc. - Located on mounting panel behind front switch panel. To replace switches, etc. remove hob, drip tray, unscrew two self-tapping screws securing cover above switches, and remove four self-tapping screws securing switch mounting panel to range (Fig. 2.)
9. Oven Vent - Through back of oven.
10. Oven Door - Drop type. Spring mechanism located behind panel below oven door. To remove panel, unscrew two self-tapping screws below panel, open oven door, and detach panel by lifting upwards, clear of clips, (Fig. 5.)
11. Wiring - 1/.064" asbestos covered wire. Accessible after removing hob, switch cover and rear panel. Wiring diagram, (Fig. 6.)
12. Other Features - Removable Drip Tray. (Fig. 2.)

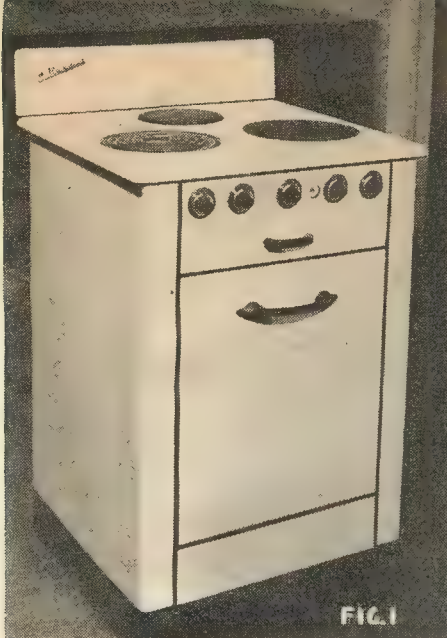


FIG. 1

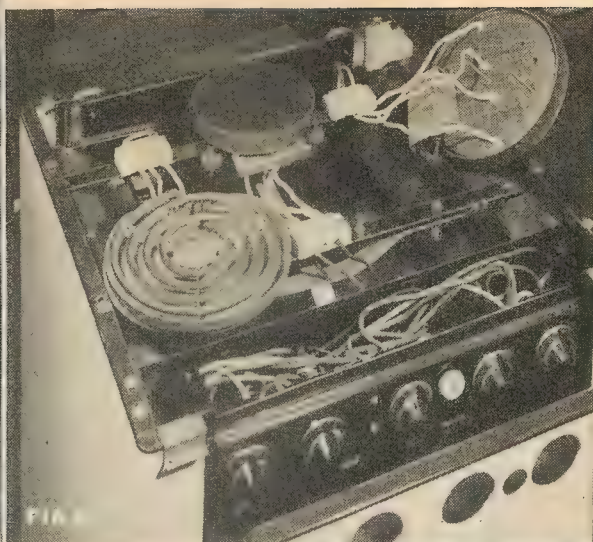


FIG. 2

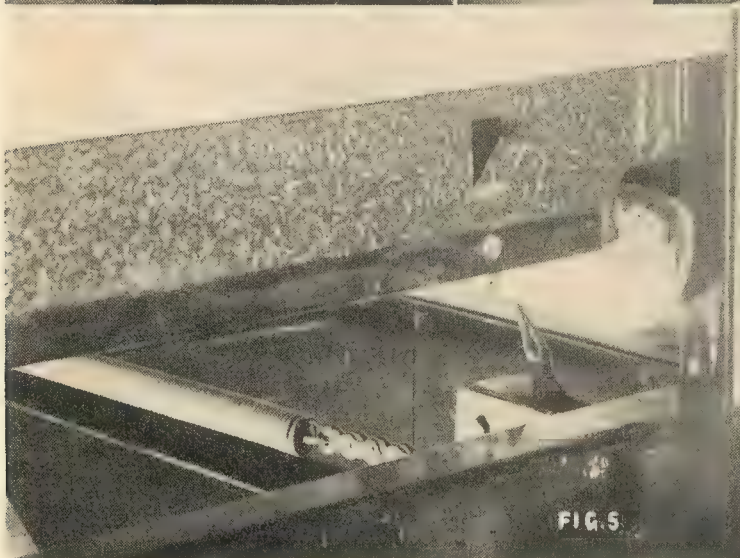


FIG. 5



FIG. 4

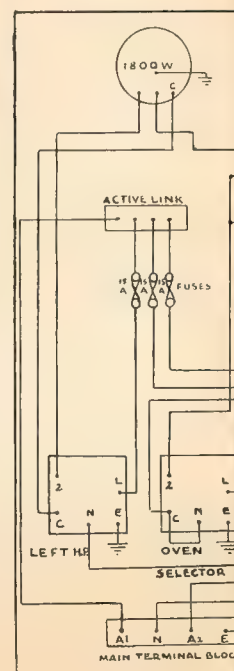
switches, etc., remove hob, drip tray, unscrew two self-tapping screws securing cover above switches, and remove four self-tapping screws securing switch mounting panel to range. Fig. 2.

Oven Vent—Through back of oven.

Oven Door—Drop type. Spring mechanism located behind panel below oven door. To remove panel, unscrew two self-tapping screws below panel, open oven door, and detach panel by lifting upwards, clear of clips. Fig. 5.

Wiring—1/.064" asbestos covered wire. Accessible after removing hob, switch cover, and rear panel. Wiring diagram, Fig. 6.

Other Features—Removable drip tray. Fig. 2.



SECTION 2.

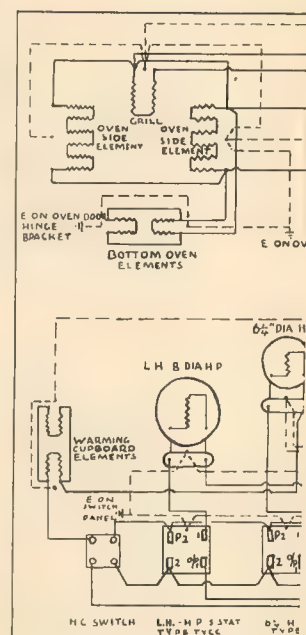
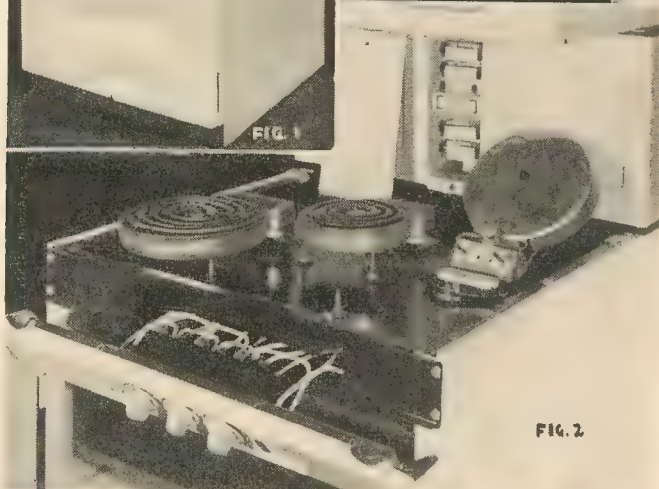
ITEM NO. 47 - ENGLISH ELECTRIC RANGE -- 3 HOTPLATE, HIGH LEVEL OVEN CABINET MODEL NO. 2020.

1. General Construction - High level oven cabinet, streamline sheet metal.
2. Finish - Vitreous enamel. Plastic switch knobs.

Plastic mounted aluminium door handles. Mottled vitreous enamel interior.
3. Hob. Heavy gauge steel pressing. Detachable by lifting. (Fig. 2. shows range with hob removed).
4. Drip Tray. Fixed, to gain access for cleaning, lift off hob.
5. Fuses. Located behind central panel at rear of hotplates. Accessible by lifting hob and removing two screws from fuse cover. (Fig. 2.)
6. Main Terminals. At rear. Accessible by removing cover in lower back panel. (Fig. 3.)
7. Hotplates. Radiant, plug-in type with earth pin. (Fig. 2.) Reflector also acts as cradle.
8. Oven Elements. Side Oven Elements: two separate elements on each side; plug-in type with earth pin; accessible by removing oven side baffles. (Fig. 4.)

Top Oven Element: plug-in type with earth pin; plugs into right-hand side of oven. (Note: It is necessary to detach left-hand side baffle before removing top oven element). (Fig. 4.)

Bottom Oven Elements: Two separate strip elements with nut and bolt connections; accessible by removing right hand side panel (Fig. 5.), door spring level, and bearing bracket.
9. Oven Controls. Oven thermostat. Griller simmerstat (type T.Y.C.) Automatic Oven Timer and Minute Timer; behind right hand side oven panel. Fig. 5 shows panel removed.
10. Hotplate and Warming Cupboard Controls. Simmerstats (type T.Y.C.C.) controlling hot-plates, double pole toggle switch for warming cupboard elements, behind panel under hob.



- Accessible after re
on top and bottom
- (11) *Warming Cupboard*
under top shelf of
by removing main
(Fig. 3.)
 - (12) *Oven Vent.* Throug
 - (13) *Oven Door.* Drop
left and right side
 - (14) *Wiring.* 1/.064in.
by removing switch
Fig. 6.
 - (15) *Other Features.* C
be controlled auto
by hand. Top ove
grilling or fast ove
when any hotplate
on. Oven baffles

SECTION 2.

ITEM NO. 48 - "HOTPOINT" RANGE - 2 HOTPLATE R.A.2. UPRIGHT CABINET MODEL.

1. General Construction - Streamlined sheet metal.
2. External Finish - Vitreous enamel, chrome and plastic door handles. Plastic switch knobs.
3. Hob - Heavy gauge pressed sheet metal. To remove, lift splash back off press studs and remove two screws at rear surface of hob.

Lift back of hob clear of hotplates and pull forward until bottom front lip is clear of remaining clip.

NOTE: If back of hob is difficult to lift clear of hotplates, don't use force as this may damage enamel. Proceed as follows:

- (a) Open grill compartment door and loosen four nuts securing 9" x 7" hotplate and securing nut under 8" diameter hot plate.
 - (b) Slide hotplates forward.
 - (c) Pull hob forward until bottom front lip is clear of retaining clip and lift hob upwards. Figs. 2 and 3 show hob removed.
4. Fuses - Screw in type, located in griller compartment behind cover plate. Fig. 3 shows fuse cover plate removed.
 5. Main Terminals - At back of range. Accessible after removing top panel. Fig. 3.
 6. Hotplates - 8" dia. cast, secured to range with 5/16" centre stud and nut. 9" x 7" radiant, secured with four 1/4" CSK/HD screws and nuts. Hotplate pigtail connections direct to switch terminals; earthed by pigtail connection to stud. To replace hotplates, remove hob. Fig. 2. shows hob and hotplate removed.
 7. Oven Elements - Tubular plug-in type in two sections, each covering one side and part of bottom. Accessible after removing side and bottom baffles. Fig. 4.
 8. Switch, "Simmerstat", Thermostat and Pilot Lamp - Behind switch panel, below front of hob. Accessible after removing hob. Fig. 2.
 9. Oven Door - Drop type, with spring mechanism behind left and right hand side panels. Fig. 3.
 10. Griller Door - Drop type, with spring mechanism behind right hand side panel. Fig. 3.
 11. Vent - Through oven door under each end of door handle.



to stud. To replace hot-plates, remove hob. Fig. 2 shows hob and hotplate removed.

Oven Elements — Tubular plug-in type in two sections, each covering one side and part of bottom. Accessible after removing side and bottom baffles. Fig. 4.

Switch, "Simmerstat", Thermostat and Pilot Lamp — Behind switch panel, below front of hob. Accessible after removing hob. Fig. 2.

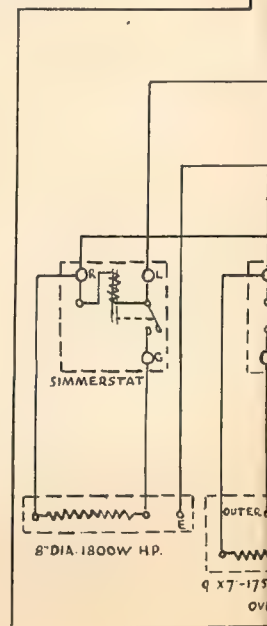
Oven Door — Drop type, with spring mechanism behind left and right hand side panels. Fig. 3.

Griller Door — Drop type, with spring mechanism behind right hand side panel. Fig. 3.

Vent — Through oven door, under each end of door handle.

Wiring — 1/.064" asbestos covered copper wire. Accessible by removing hob, side and rear top panel. Wiring diagram, Fig. 5.

Other Features — Separate grilling compartment, smokeless type grill pan. Wooden cabinet or tubular chrome plated metal legs supplied as required. Slag wool and aluminium foil oven insulation.



SECTION 2.

ITEM NO. 49 - "McILWRAITH" ELECTRIC RANGE - E3 ELEVATED MODEL 3-HOTPLATE.

General Construction - Streamlined sheet metal.

Finish - Vitreous enamel. Plastic switch knobs and handles. Mottled vitreous enamel interior.

Hob - Heavy gauge sheet steel pressing; removable by pulling drip tray forward, unscrewing two self-tapping screws from brackets under front of hob, lifting front of hob clear of hotplates and sliding forward from two locating brackets on range at rear of hob. Fig. 2 shows hob removed, exposing brackets on each side of switches and at rear of range.

Fuses - Behind switch panel at front. Fuse wedges accessible by removing drip tray. To remove fuse box, unscrew two self-tapping screws and remove fuse cover. (Fig. 3.)

Main Terminals - At rear, accessible by removing cover. Fig. 5.

Hotplates - Pitgail connections to porcelain terminal blocks located below hob. Plug-in earth with locating pin on cast hotplates, radiant hotplates secured with 5/16" dia. stud and nut to support bracket. To replace hotplates, remove hob. Fig. 2.

Oven Elements - Top and bottom plug-in connection, thermostatically controlled. Fig. 4.

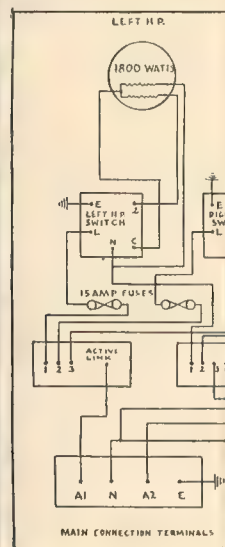
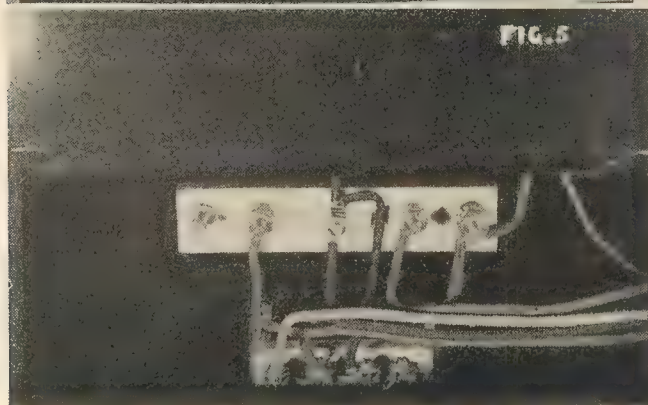
Switches and Thermostat, etc. - Located on mounting panel behind front switch panel. To replace switches, etc., remove hob, drip tray, unscrew two self-tapping screws securing cover above switches, and remove four screws and nuts securing switch mounting panel to range. Figs. 2 and 3.

Oven Vent - Through back of oven.

Oven Door - Drop type. Springs and rollers accessible from under oven. Hinge mechanism is located below oven door, behind panel. To remove panel, unscrew nuts from rear of panel below oven and switch panel. Fig. 3 shows panel removed exposing hinge mechanism.

Wiring - 1/.064 asbestos covered wire. Accessible after removing hob, switch and fuse covers, and panel at rear of oven. Wiring diagram Fig. 6.

Other Features - Removable drip tray and oven slide racks.



fuse box, unscrew two self-tapping screws and remove fuse cover. (Fig. 3.)

Main Terminals — At rear, accessible by removing cover, Fig. 5.

Hotplates — Pigtail connections to porcelain terminal blocks located below hob. Plug-in earth with locating pin on cast hotplates, radiant hotplates secured with $\frac{5}{16}$ in. dia. stud and nut to support bracket. To replace hotplates, remove hob, Fig. 2 .

Oven Elements — Top and bottom plug-in connection, thermostatically controlled. Fig. 4.

Switches and Thermostat, etc. — Located on mounting panel behind front switch panel. To replace switches, etc., remove hob, drip tray, unscrew two self-tapping screws securing cover

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Oven I
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own in Fig. 3 is $22\frac{1}{2}$ minutes. Turning the white knob in closes the switch and the hotplate or power is on and remains on until the white hand and the "0" on the scale come opposite the mark when the white knob will be pulled out and the current will be cut "off." The electrically connected bell will ring and continue to ring until the white knob is turned slightly anti-clockwise to the off position and pulled out to full.

It is necessary to cut off the power before the end of the pre-set time. Turn the white knob at the end of the timer anti-clockwise until the ringing commences, then turn the knob anti-clockwise and pull out to the "off" position.

The "Minute Minder" as indicator

The timer may also be used to time any operation in which case the control, or selector switch, is left at off position. Then set the dial as above (para (b)) and the bell will ring at the desired time. The timer is accurate to 15 minutes.

When connecting "Midgley-Harmer" timers may differ according to the range to which they are used. Therefore, the range manufacturer's instructions should be referred to when necessary.

Efficiency in Power Stations

(continued from page 13)

The power industry feared that their revenues from the new lamps would have the very reverse effect. The efficiency of the new lamps has served to let loose a flood of new revenues of the power industry. The revenues have leapt forward rather

SECTION 2.

ITEM NO. 50 - "ROWCO" ELECTRIC RANGE - LOA2 UPRIGHT MODEL 2-HOTPLATES.

General Construction - Streamlined sheet metal.

Finish - Vitreous enamel. Plastic switch knobs and handles. Mottled vitreous enamel interior, sprayed enamel plinth.

Hob - Heavy gauge sheet steel pressing. To remove, open drip tray, unscrew knurled knob under hob, lift front and pull forward. Fig. 2 shows top of range with hob removed.

Fuses - Accessible by removing hob. Fig. 2.

Main Terminals - At rear of range. Accessible by removing lower back panel. Fig. 3.

Hotplates - Radiant, 8" dia. Secured to range with 5/16" dia. centre stud.

Cast griller-hotplate located with brackets at front and rear.

Pigtail connections on both hotplates to porcelain connectors in channels located below hob. Fig. 2 shows Radiant hotplate and channel cover removed exposing connector.

Oven Elements - Top and bottom, thermostatically controlled in conjunction with selector switch. Pigtail connections to spring loaded bars. Figs. 3 and 4.

To replace, remove wire guard or cover, place pins in hobs provided in spring loaded bars, remove element pigtails and cotter pin in front of slide. Pull element assembly forward.

Switches, "Simmerstat", Oven Thermostat and Pilot Lamp - Below top of splash back. To replace remove top back panel. Fig. 3.

Power Outlet - Located at right hand side of splash back. To replace, remove all switch knobs and locknuts and detach splash back. Fig. 3 shows power outlet exposed.

Oven Door - Drop type, secured in closed position with two ball catches. Spring mechanism behind side panels. Fig. 3.

Vent - Through oven door. Fig. 1.

Wiring - 1/.064" asbestos covered copper wire. Fig. 5. details wiring diagram.

Other Features - Removable drip tray, detachable oven slide racks, separate griller.

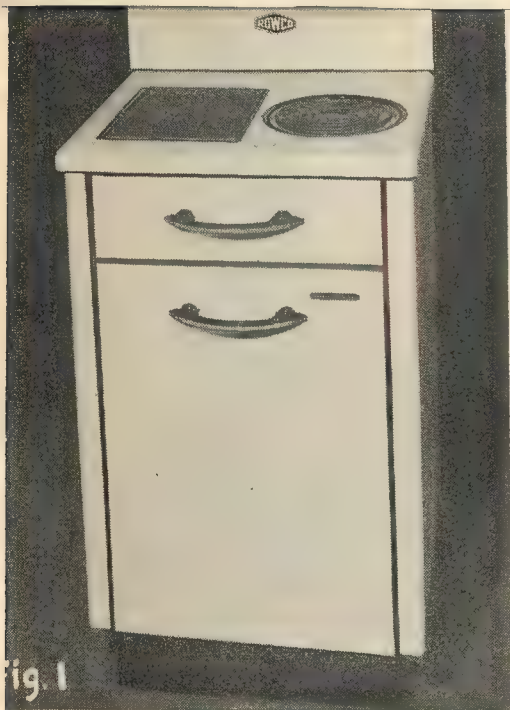


fig. 1.

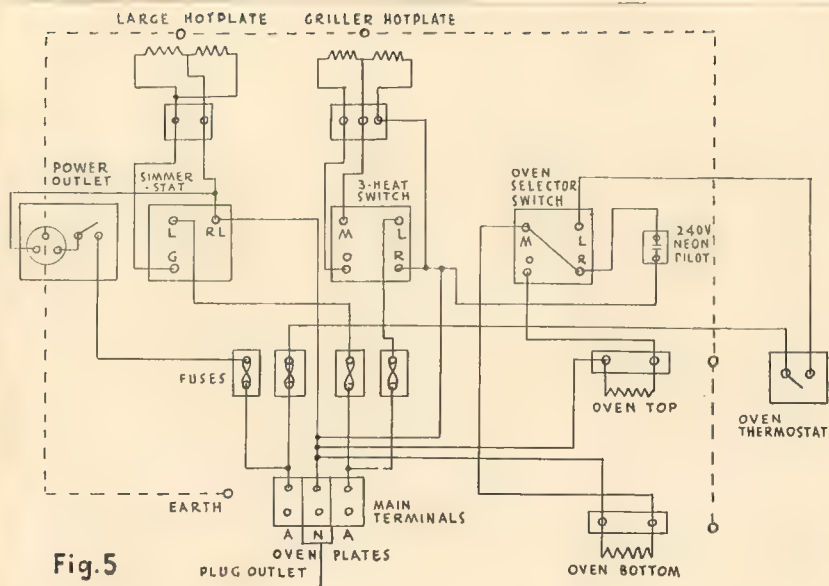


Fig.5

Wiring — 1/.064" asbestos covered copper wire. Fig. 5 details wiring diagram.

Other Features — Removable drip tray, detachable oven slide racks, separate griller.



SECTION 2.

ITEM NO.51 - "SIMPSON" ELECTRIC RANGE - UPRIGHT MODEL E17 - 3 HOTPLATES.

General Construction: Streamlined sheet metal.

Finish: Exterior. Vitreous enamel, plastic switch knobs, chrome plated handles. Interior. Mottled vitreous enamel.

Hob: Heavy gauge sheet steel pressing. Hinged at rear with splash back and located by two clips in front of range.

To raise hob, pull top of splash back forward, Fig.2, (this operation disengages front of hob from locating brackets), lift front of hob and snap open with support arm. Fig. 3.

To close hob, pull splash back forward, press down front of hob to engage under locating brackets, return splash back to normal position.

Fuses: Accessible by pulling top of splash back forward and removing cover plate. Fig.2.

Main Terminals: Accessible by removing splash back rear panel. Fig.4.

Hotplates: Radiant; plug-in type. Griller hotplate cast; plug-in type. E.D.A. (British) standard. Accessible after raising hob.Fig.3.

Oven Elements: Top and bottom: Plug-in connections, Fig.5. Oven elements controlled by 2-stage thermostat and "Oven Timer."

Switches, timer, and thermostat, etc. located on splash back.

- (a) 3-heat switches and "Simmerstat with "D" shaped spindles for push-on type knob.
- (b) "Midgley-Harmer Timer" incorporating:
 - (i) Electrically operated settings for switching oven elements "on" and "off" at predetermined times.
 - (ii) Electrically driven "ringer" type "minute minder" for automatically switch "off" hotplate at a predetermined time, or for timing any cooking operation.
- (c) "Satchwell" type "H.R.S." single pole, two-stage oven thermostat incorporating "push-button" control of top oven element for quick preheating.

To replace switches, etc., remove splash back rear panel. Fig.4.

Oven Light: Special 40 W. heat resisting lamp with standard E.S. cap; located in rear wall of oven. Fig.5. Single pole toggle control switch in splash back.

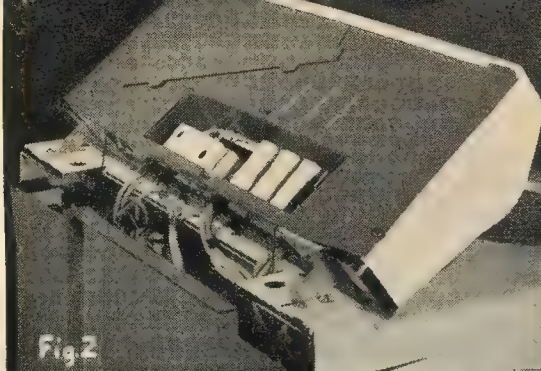


Fig. 2

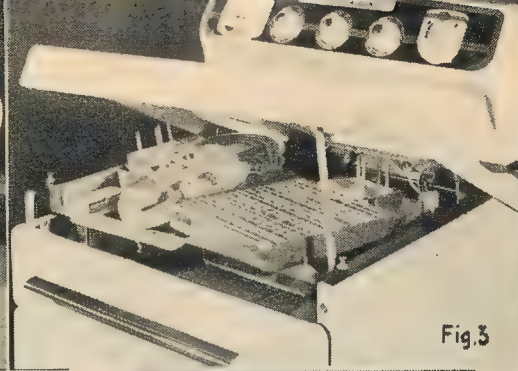


Fig. 3



Fig. 1



Fig. 4

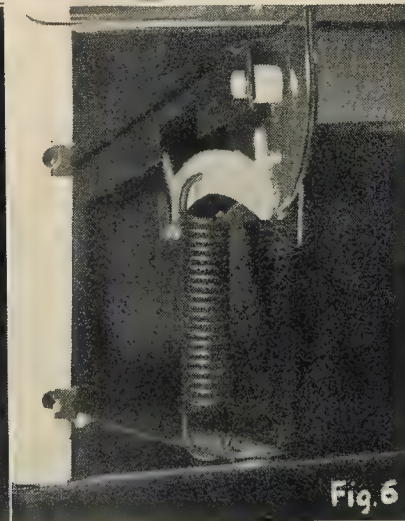


Fig. 6

(c) "Satchwell" type "H.R.S." single pole, two-stage oven thermostat incorporating "push-button" control of top oven element for quick preheating.

To replace switches, etc., remove splash back rear panel. Fig. 4.

Oven Light: Special 40W. heat resisting lamp with standard E.S. cap; located in rear wall of oven. Fig. 5. Single pole toggle control switch in splash back.

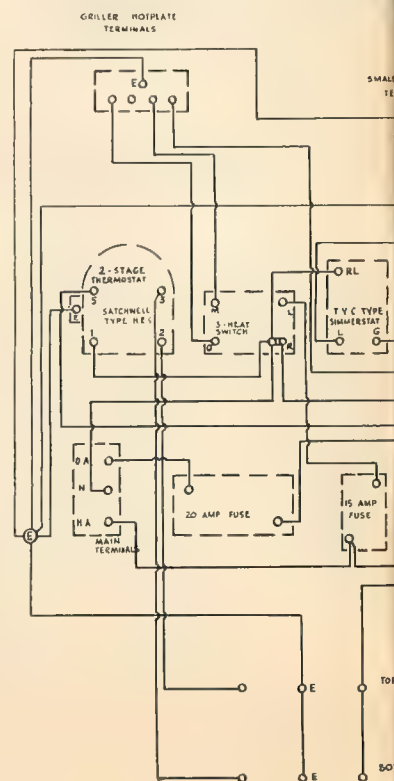
Oven Vent: Along top inside edge of oven door.

Oven Door: Drop type. Spring mechanism accessible by removing chrome plated panel held on by self tapping screws below the oven. Fig. 6.

Wiring: Asbestos covered heat resisting wire. Accessible after removing back panels, Fig. 4, and raising hob, Fig. 3. Wiring diagram Fig. 7.

Other features: Separate grilling compartment with drop down door. Double armour plate glass window in oven door, and oven interior lamp. Hinged splash back, and chrome plated kick plate below oven. Combination "Oven Timer" and "Minute Minder."

Fig. 7 Wiring Diagram





THIS MAN

THERE are several ways in which a man can make an attractive impression from his home — quite apart from the design. One way is to set the house well back — say 30 yards or more — but this is rarely possible in our suburbs. Another way is to take full advantage of the frontage. This is the way chosen by Mr. and Mrs. H. Fletcher. Their all-electric home spreads across the frontage as far as legally possible.

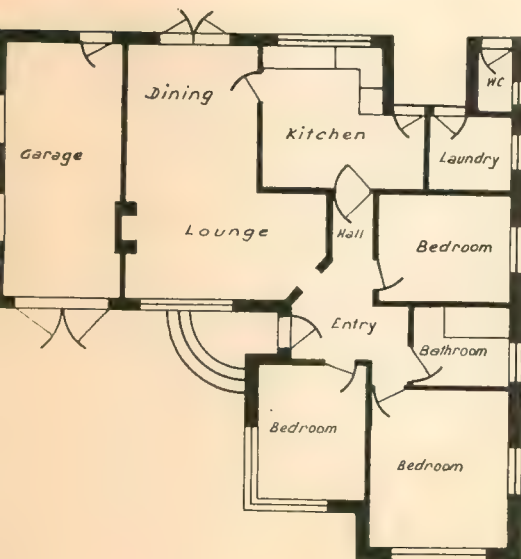
Mr. Fletcher is a testing officer in the Turramurra County Council and his new 3-bedroom bungalow is in quiet Birubi Avenue, Turramurra. From the front windows you can see the park and a street through a fringe of bushland. He built out.

The home design is an adaptation of a design that originally appeared in a Sunday newspaper. Home builders of today frequently have to decide, for reasons of economy, whether to have an entrance hall or not. The general desire seems to be for an entrance hall. In this case, Mr. and Mrs. Fletcher decided on a hall, but there came a time when it seemed to them that it was going to be too small.

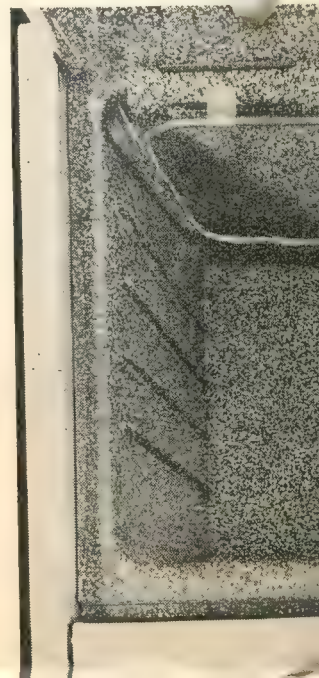
They solved the problem in a simple but interesting way. They made a diagonal entrance to the living room. This not only gave the extra space they wanted in the hall, but added charm to the hall and the living room.

They have also avoided the customary rectangular shape of the kitchen. The back porch has caused this and the rear door is of the Dutch type. Top and bottom halves of the door opened separately. Kitchen is 10 ft. x 11 ft. and is spacious enough to dine in with.

Kitchen colour scheme is a cheerful one. The walls are primrose and this is matched by the ceiling.



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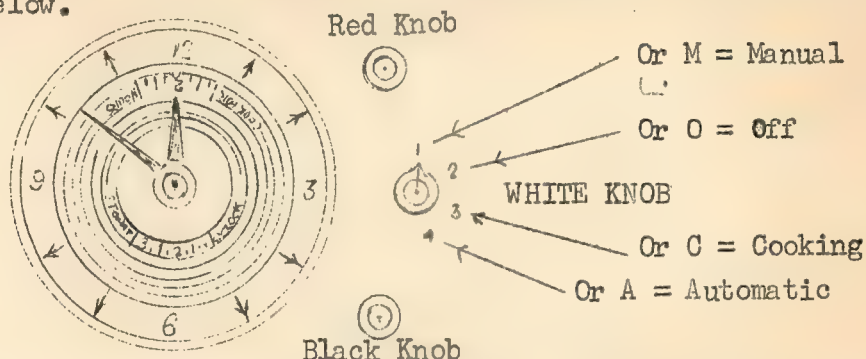


ITEM NO. 52. - AUTOMATIC TIMERS AND MINUTE MINDERS.

A. "Smith Oven Timer".

(i) Description and Operation.

Consists of an electric clock mechanism, clock face and hands, black, white and red setting knobs and an automatically operated switch. See Fig. 1 below.



The outer ring of the dial is graduated in hours like an ordinary clock face. The hands are set to the correct time by turning the small knob in the centre of the dial. The Timer will continue to show the correct time as long as power supply to range is maintained. If supply is turned off, however, the clock will stop, and hands will need re-setting when supply is restored. The dial of the automatic oven timer also includes two smaller scales, one red, the other black, both graduated in hours and quarter hours.

The red scale is marked "Cook forHours", and refers to the length of cooking period required. It is set by turning the red knob.

The black scale marked "Stop atO'clock," indicates the time at which the meal is required to be ready. This is set by turning the black knob.

The oven timer switch is set by turning the white knob situated between the red and black knobs. The method of indicating the four positions of the switch may differ between ranges and reference should always be made to the range manufacturer's instructions.

Typical markings used correspond to the following conditions:

- 4 = Switch set ready to be closed in by clock.
- 3 = Switch has been closed in by clock, or by hand, and cooking is in progress.
- 2 = Switch has been tripped out by clock, cooking is complete.
- 1 = Timer off, oven switched to manual control.

NOTE: When it is necessary to move the above switch knob anti-clockwise, i.e. from 4 to 1 position, the knob must be pushed in before turning.

(ii) Setting the Oven Timer for Automatic Control.

- (a) Check electric clock against correct time. Alter clock hands if necessary by turning small knob in centre of dial.

- (b) Decide at what time the meal is required to be ready (that is at what time you want the oven to switch "Off"). Set this time on the black scale, by turning the black knob.
- (c) Decide how long the meal will take to cook. Add approximately 15 minutes (this time may vary according to type of range), to this for heating up the oven, and set the total time on the red scale by turning the red knob. For example: If the normal cooking time for a meal is 3 hours - the total cooking time you will set on the red dial will be 3 hours plus 15 minutes, giving a total cooking time of 3 hours 15 minutes.
- (d) Set the timer ready to cut in by turning the white selector knob to position 4.
- (e) Set oven thermostatic controls, and oven selector switch where fitted. Place food in oven and close door. Note: When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during pre-heating.
- (f) When the cooking period commences, the white knob automatically moves from No. 4 position to No. 3 position and energizes the oven element.
- (g) When the cooking period is finished the white selector switch knob moves from No. 3 to No. 2 position and switches "Off" the oven elements.
- (iii) Use of Oven Timer to Switch "OFF" only.
 - (a) Check electric clock against correct time. Alter clock hands if necessary by turning small knob in centre of dial.
 - (b) Decide when you desire the cooking to stop. Set this time on the black scale by turning the black knob.
 - (c) Turn white selector knob to position 3.
 - (d) Set oven thermostatic controls and oven switch where fitted, place food in oven and close door.
NOTE: When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during pre-heating. However, oven can be pre-heated with top element before placing food in oven if so desired.

- (e) When cooking period is finished, oven will automatically switch "off" as detailed in clause (ii) para. (g).

(iv) Manual Control of Oven.

To change from Automatic Oven Timer to ordinary Hand Control, press the white selector knob and it will move to position No. 1. This knob must always be left in position No. 1 when not using the oven for automatic cooking.

(v) Wiring Diagrams.

Methods of connecting "Smith Oven Timers" may differ according to the type of range to which they are fitted, therefore, the range manufacturer's wiring diagram should be referred to when necessary.

(B) "Smith" Ringer Timer (Minute Minder).

This ringer timer is operated by clockwork and is not connected to the electrical circuit. It serves as an interval timer and emits a continuous ringing (approximately 6 seconds) at the end of any pre-set time for two minutes to four hours.

The large dial is graduated in minutes from "0" to "60" and the small window indicates the hours, "0" to "4". The setting pointed in the centre also winds the clock and alarm. See Fig. 2 below.

To set timer:-

- (i) Turn the pointer in a clockwise direction to the full turn for every hour, and for every additional minute, turning it to the appropriate mark on the dial.

The alarm will ring when the time period has expired and the pointer and indicator have returned to "0" positions.

NOTE: When setting timer the pointer should be turned at least one full revolution to adequately wind the ringer before turning pointer to required setting, e.g., if setting of 10 minutes is required, turn pointer clockwise to 60 min. graduation and then anti-clockwise to 10 minute setting.

If, by accident, the pointer is turned past the desired setting, it can be turned back anti-clockwise without damage.

(C) "Midgley-Harmer Automatic Timer" and "Minute Minder" (Fig. 3).

The oven timer and minute minder are incorporated in the same casing and when set for use are both operated by the same synchronous motor. However, there is no electrical connection between the two sections which are designed to control sections of the range, etc., independent of each other as follows:-

(i) "Oven Timer" Section.

Generally used for switching oven "on" and "off" at pre-set times switching oven "off" only, or can be switched entirely out of circuit so that oven can be manually controlled.

The maximum cooking time which the "timer" can be set is 11 Hours 45 minutes and the start of the cooking can be delayed from 15 minutes to 11 Hours 45 minutes after the timer is set.

(ii) "Minute Minder" Section.

Generally used for switching "off" only a hotplate at a pre-set time when a warning bell rings. The bell will ring until it is manually re-set. The "minute minder" can be pre-set to switch off at any period from "0" to 4 hours, but cannot be set to switch "on" automatically.

The "minute minder" can also be used to control a power outlet or hotplate by means of a selector switch, or as a "minute minder" for timing any cooking process that does not require automatic control.

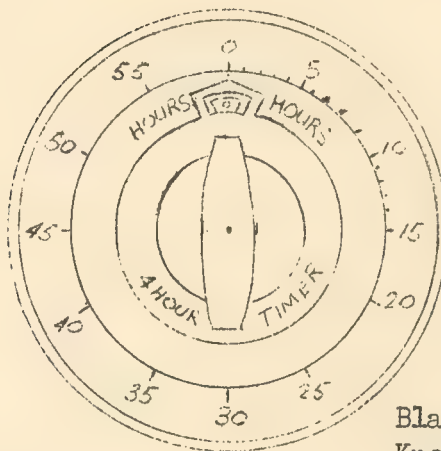


Figure 2

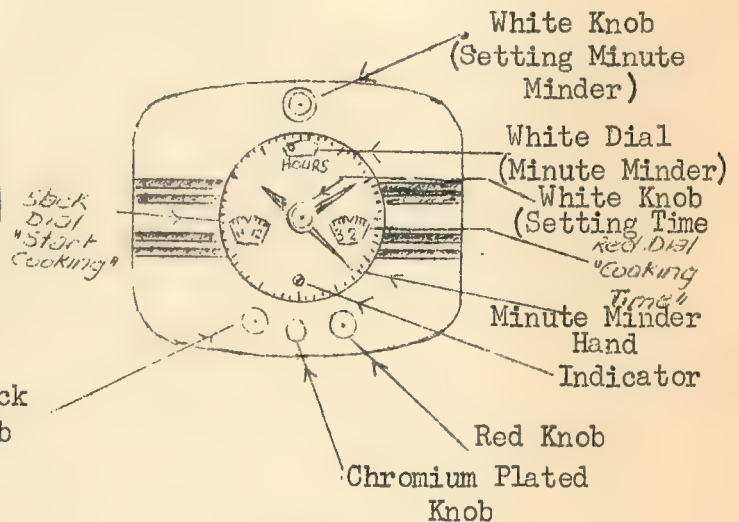


Figure 3.

(a) Description and Operation of "Oven Timer".

The "oven timer" section consists of clock face and hands, indicator to show clock is operating and white, red, black, and chrome plated setting knobs. The white knob in centre of clock face sets the hour and minute hands, whilst the other knobs when pre-set, control the electrical circuit by means of a double pole switch.

The outer ring of the dial is graduated in hours like an ordinary clock face. To set hands to correct time, turn the white knob

in the centre of the dial. The timer will continue to show the correct time and the black indicator with white line will rotate as long as supply to range is maintained. If supply is turned off, however, the clock will stop and hands will need re-setting when supply is restored. The dial of the oven timer also includes two smaller scales, one black, the other red, both graduated in hours and quarter hours. The black scale marked "Start Cooking," indicates the time at which it is desired to start cooking the meal. This is set by turning the black knob.

The red scale marked "Cooking Time," refers to the length of cooking period required. It is set by turning the red knob. Note: It is immaterial in which direction the red and black knobs are turned.

The chrome plated push button knob is for manual control only.

(b) Setting the Automatic Timer to Switch "On" and "Off".

Assume a meal requires 2 hours cooking time and is to commence cooking at 11.30.

(i) Check electric clock against correct time. Alter clock hands if necessary by turning white knob in centre of dial.

(ii) Push the black knob in as far as possible and turn the black (Start Cooking) dial until 11.30 is opposite the pointer.

(iii) Push the red knob and set the red (Cooking Time) dial to 2 hours. It will be necessary to add extra time to the normal cooking time for heating the oven. This time varies according to type of range. Assuming it is 15 minutes, then red scale shall be set to 2 hours 15 minutes. Note: Knobs may be turned in any direction when pushed in.

(iv) Set thermostat controls and oven selector switch where fitted. Place food in oven and close door. Note: When cooking in above manner in oven with top heating, top element should generally not be used as food would be come scorched during pre-heating.

(v) The oven will automatically switch on at 11.30 and off at 1.45.

(c) Use of "Oven Timer" to Switch "OFF" Only.

(i) Check electric clock against correct time. Alter clock hands if necessary by turning white knob in centre of dial.

(ii) Push in black knob to set black (Start Cooking) dial to same time as indicated by clock hands. The black knob will then snap forward.

(Over)

(iii) Set red (Cooking Time) scale to the desired time period. Note: Knobs may be turned in either direction when pushed in.

(iv) Set thermostat controls and oven selector switch where fitted and place food in oven. Note: When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during pre-heating.

However, oven can be pre-heated with top element before placing food in oven if so desired.

(v) The oven is now switched "on" and will automatically switch "off" at end of period as indicated on "Cooking Time" scale.

(d) Manual Control.

(i) Check electric clock against correct time. Alter clock hands if necessary by turning white knob in centre of dial.

(ii) Push in black knob and set black (Start Cooking) dial to same time as indicated by clock hands. The black knob will then snap forward.

(iii) Set "Cooking Time" scale to "0" setting. Red knob will now snap forward and automatic control is eliminated.

(iv) Push the chromium plated knob in as far as possible. The oven can now be used for manual operation by setting the thermostatic oven control, and oven selector switch where fitted. The chromium plated knob will automatically be released when the oven is next set for automatic control at the time the red cooking time dial is set. Thus, there is no possibility of setting the time control for automatic operation and leaving the oven connected to the thermostatic control or oven selector switch for manual operation.

(D) "Midgley-Harmer Minute Minder."

(i) Description and operation.

The "minute minder" section consists of a minute sweep hand, scale for indicating number of hours, and white setting knob above clock face. When minute hand and scale is set, a single pole switch closes and does not open until both the minute hand and scale returns to "0" position when the bell rings.

(ii) To set "Minute Minder" as Hotplate or Power Outlet Control.

(a) Set selector switch (if selector switch is fitted) on range to the hotplate or power outlet it is desired to control, and switch on hotplate switch or power outlet.

7.

(b) Push the white knob at top of timer in as far as possible, and turn until the white hand moving in a clockwise direction indicates the desired cooking time in minutes on the large dial and hours if time exceeds 60 minutes, on the white scale. Setting shown in Fig. 3 is $22\frac{1}{2}$ minutes. Pushing the white knob in closes the switch and the hotplate or power outlet is on and remains on until the white hand and the "0" on the white scale come opposite the pointer when the white knob will spring out and the current will be switched "off". The electrically operated bell will ring and continue ringing until the white knob is turned slightly anti-clockwise to stop position and pulled out to full extent.

(c) If it is necessary to cut off the supply before the end of the pre-set time, turn the white knob at the top of the timer anti-clockwise until the ringing commences, then turn knob anti-clockwise and pull out to stop.

(iii) To set "Minute Minder" as indicator only.

This control may also be used to time any cooking operation in which case the hotplate control, or selector switch, should be left at "off" position. Then set the white dial as above (para. (b)) and the bell will ring at the desired time.

(iv) Wiring Diagrams.

Method of connecting "Midgley-Harmer" automatic timer may differ according to the type of range to which they are fitted, therefore, the range manufacturer's wiring diagram should be referred to when necessary.

DEFECTS IN AUTOMATIC TIMERS.

When unsatisfactory supply to an oven or hotplate is due to a defect in the respective switch contained in an Automatic Timer, supply may be adjusted temporarily by bridging the defective switch.

Cooking by the affected oven or hotplate can then proceed as with non-automatic ranges.

Connections to the Automatic Timer are accessible by removing the plate at the rear of the splash-back.

AUTOMATIC ELECTRIC RANGE TIMERS

ATL "Twinmatic" Combined Oven and Hotplate Timer

Several models of Australian-made electric ranges are now being fitted with an electric timing unit with independent dual switching controls, manufactured locally by Automatic Totalisators Ltd. This unit, the "Twinmatic", is suitable for application to domestic electric ranges and to time-controlled process equipment.

In an electric range the "Twinmatic" can provide independent control over two separate switching circuits, the timer controls being (1) the oven timer and (2) the hotplate or minute timer.

The unit is designed for operation on 250 volt 50 cycle A.C. supply and includes a 25 amp. single-pole oven switch, 18 amp. single-pole hotplate switch, 24-hour time cycle, 22-hour switching period, and 4-hour minute timer.

OVEN TIMER

The total possible operating time is 22 hours, any part of which can be used for the delay in switching ON, and any of the remaining time for cooking and switching the oven OFF.

HOTPLATE OR MINUTE TIMER

The fitting of a selector switch to a range enables the "Twinmatic" to control any one of the

hotplate elements as selected, or one or more power outlets fitted to the range.

The timer can be set to switch the selected element OFF up to $3\frac{3}{4}$ hours ahead of "present" time. By leaving the hotplate selector switch OFF the timer can be used as a reminder, since the tripping of the timer also operates a buzzer.

SETTING CLOCK TO CORRECT TIME

This is necessary only when the clock is originally installed or in the event of a power failure.

Pull out the right hand (black) knob and turn in the direction indicated by the arrow on the dial (anti-clockwise).

As the clock mechanism operates on a 24-hour cycle the hands must be set to "day" or "night" time. A small window above the hour 6 shows "black" for night and "silver" for day.

NORMAL OVEN OPERATION

To operate the oven without automatic control, the bottom (silver) knob is turned to the left to the "Manual" position, thus isolating the automatic control and leaving the range free for normal use.

AUTOMATIC OVEN OPERATION

1. Select the time at which the oven is required to switch OFF by turning the BLACK knob anti-clockwise (as indicated by the arrow); the selected time will show on the indicator on the right hand side of the dial.

2. Select the required ON time on the left indicator by turning the RED knob anti-clockwise.

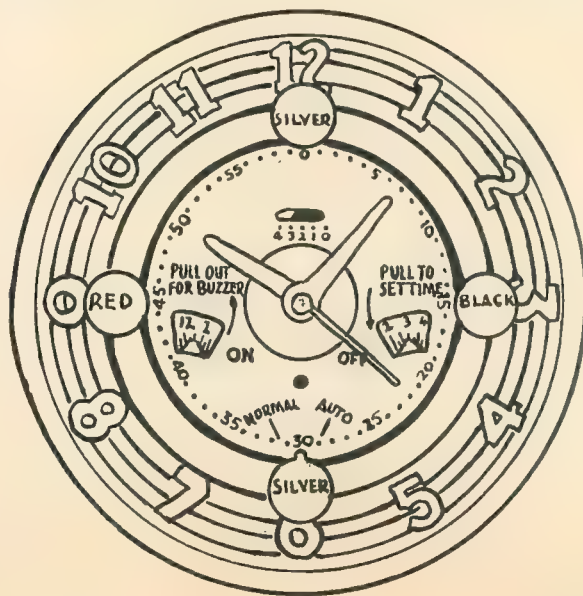
3. Turn the BOTTOM (silver) knob to AUTO and turn the oven thermostat to the required temperature.


AUTOMATIC HOTPLATE OPERATION

The hotplate timer hand turns continuously whether in use or not, in an *anti-clockwise* direction, indicating the time lapse after the switch has tripped, thus giving an additional time function.

An indicator below the hour 12 shows the "hours" (up to 4) to elapse before the trip operates and switches the hotplate off. Acting like the sand in an hour glass, the black area of the indicator

(continued on page 111)





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.T.L. "Twinmatic"
1958, issue of *The*
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Examination

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spring mechanism.



ATL "TWINMATIC"

shows at a glance the setting of the 4-hour timer.

To set the timer to switch the hotplate OFF in, say, 2 hours 22 minutes, turn the TOP knob until the red hand points to 22, and the hour indicator mark is between 2 and 3 hours.

Pull out the RED knob, which will set the trip mechanism ready for operation.

Turn the hotplate control switch ON to the required setting.

When the red hand reaches "0" on its third revolution (for 2 hours 22 minutes), the trip will operate, switching the hotplate off and operating the buzzer.

The buzzer will continue to sound until the RED knob is pushed in. The hotplate control switch should then be turned OFF.

SERVICING

Simplification of servicing has been assisted by use of "Quick" connectors for all connections, permitting easy connection and disconnection in assembly or service.

With all automatic timers, whether used for oven or hotplates, the thermostat or hotplate control switch should be turned to OFF as soon as possible after the cooking operation has been completed, to prevent possible inadvertent operation. The selector switches should be turned to manual.

AUTOMATIC OVEN TIMERS

Smith's "Secrimatic" Timer, Model No. OCU.2500/A (New non-ringer type)

THIS article describes, and details the operation of and method of setting the new "Secrimatic" model (Fig. 1), which supersedes the "Smith Oven Timer" described in the January, 1957 issue of *The Contactor*.

Like the previous model, the new timer is of the non-ringer type and performs the same operations, being mainly used only as an oven control. However, with the use of a selector switch, the timer can be used to control either oven, hotplate, or power outlet.

Methods of connecting "Smith Oven Timers" may differ according to the type of range to which they are fitted, therefore the range manufacturer's wiring diagram should be referred to when necessary.

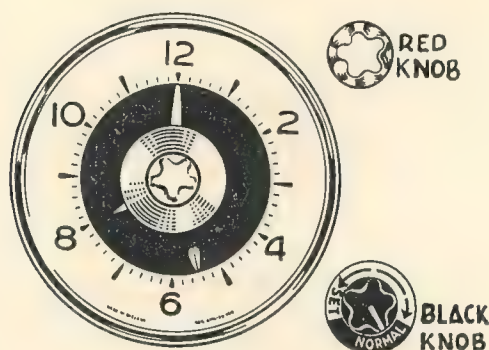


FIG. 1

DESCRIPTION

The timers differ as follows:

- On the previous type, two knobs and two separate scales were provided for automatic setting.
- On the new type, one knob is used and the cut-in and cut-out times are set to the general time numerals on the main face.

The RED setting knob rotates the black inner circle of the clock face, which is made in two moving sections, joining at the middle of a white pointer. (Fig. 1.) Setting of the timer is by first

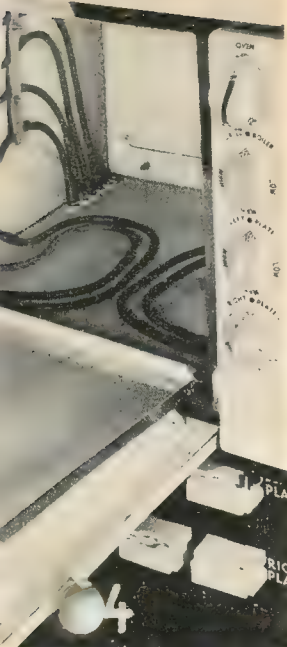
rotating the centre circle so that the pointer indicates the time when cooking is to cease, then turning in the opposite direction to open the joint in the circle so that one half of the white pointer indicates the *cut-in* time and the other half the *cut-out* time on the main clock face numerals. The widening of the pointers exposes a red background between the two pointers and this background represents the *cooking* time. (Fig. 4.)

A white knob is provided in the centre of the clock face for setting the standard clock hands, and a black knob under the red knob outside the circumference of the clock dial for setting timer for normal or automatic control.

SETTING THE TIMER

1. To set clock at correct time.
Turn white knob in centre of dial. (Fig. 2.)
2. Setting the timer for automatic control. (To switch "on" and "off").
(a) Check electric clock against correct time.
(b) Decide at what time the meal is required to be ready (that is, at what time the oven is to switch "off"). Set this time by turning the RED setting knob **anti-clockwise**, thus rotating the inner circle until the pointer is opposite this time on the white scale. (Fig. 3.)
(c) Decide how long the meal will take to cook. Add approximately 15 minutes (this time may vary according to type of range) to this time for heating-up the oven. Turn the RED knob **clockwise** until this time is indicated by the red segment, or other half of white pointer on the white scale. (Fig. 4.)
(d) Turn the BLACK knob **anti-clockwise** so that the white line is opposite the word SET. (Fig. 5.)
(e) Set oven thermostatic controls, and oven selector switch where fitted. Place food in oven and close door.

NOTE: When cooking in above manner in ovens with top heating, top element should generally



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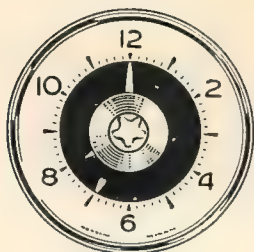


FIG. 2

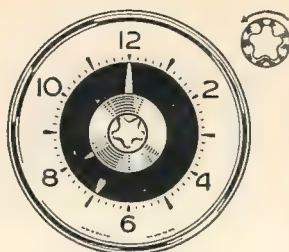


FIG. 3

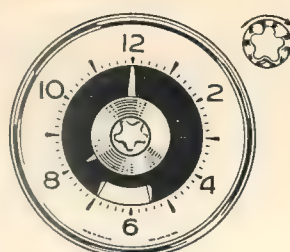


FIG. 4

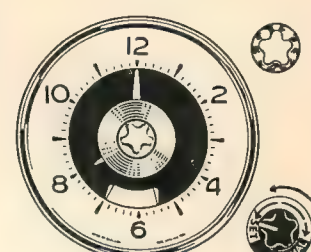


FIG. 5

not be used as food would become scorched during pre-heating.

(f) When the cooking period commences the BLACK knob automatically moves one position in a **clockwise** direction from SET position until white line on knob is opposite the centre break in white arrow on panel. The oven element is then energized.

(g) When the cooking period is finished, the BLACK knob moves **clockwise** from centre break in arrow to further break in arrow prior to NORMAL marking, and switches "off" oven element.

3. Use of Oven Timer to Switch "OFF" Only.

(a) Check electric clock against correct time as detailed in 1 (Fig. 2).

(b) Decide at what time the meal is required to be ready (that is at what time the oven is to switch "OFF"). Set this time by turning the RED setting knob **anti-clockwise** until the pointer is opposite this time on white scale. (Fig. 3.)

(c) Turn the BLACK knob anti-clockwise from NORMAL so that the white line on the knob is opposite the centre break in the white arrow on panel. (Fig. 1.)

(d) Set oven thermostatic controls and oven switch where fitted, place food in oven and close door.

NOTE: When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during pre-heating. However, oven can be pre-heated with top element before placing food in oven if so desired.

(e) When cooking period is finished, oven will automatically switch "off", as detailed in 2, para. (g).

4. Manual Control of Oven.

To change from Automatic Oven Timer to ordinary Hand Control, turn the BLACK knob fully clockwise until the white line is at the word NORMAL.

Use of Electricity in Cooking Envisioned by Benjamin Franklin

Long before the era of electricity with its electric ranges, broilers and complete electric kitchens, Benjamin Franklin envisioned the first steps toward cooking electrically.

In 1749 Franklin wrote to Peter Collinson, a fellow scientist in London, commenting on experiments with electricity.

"Chagrined a little that we have been hitherto able to produce nothing in this way of use to mankind, and the hot weather coming on when electrical experiments are not so agreeable, it is proposed to put an end to them for this season, somewhat humorously, in a party of pleasure on the banks of the Schuylkill," Franklin wrote.

What he had in mind was to hold a picnic and use electricity in helping to prepare the meal.

"A turkey is to be killed for our dinner by electrical shock," Franklin wrote, "and roasted by the electrical jack, before a fire kindled by the electrified bottle."

The electrical jack was not a true motor, but a device which could be made to rotate by using static electricity to attract or repel its elements.

The "electrified bottle" is a reference to an improvement Franklin had made to the Leyden jar, an early method of storing static electricity. While the heating element was not electrical, at least Franklin anticipated today's popularity of the rotisserie.

—Reprinted from Philadelphia Electric Co.'s Current News.



Method of securing control:—

(a) "Chromalox" mounting ring secured by push-in clips. T.Y.C. control.

(b) Cast griller. Supported on lugs. levelling screws at passes through hole. Open the grill cover lift out griller hotplate round.

Elements in above supporting. Refractor longitudinal folding by end. Element is heated. remove element, plate element can then element. secure refractors and catch element also engage in

(c) Radiant griller. Hob mounted in side hotplates. To replace

Fig. 7. E76 model and terminal cover



THE SYDNEY COUNTY COUNCIL



GREY Knob
For Minute Minder



SECTION 2.

ITEM NO. 53 - "DAVELL" MODEL C5, 3-HOTPLATE RANGE.

General Construction: Streamlined sheet metal.

Finish: Exterior; vitreous enamel, plastic switch knobs with metal surrounds and chrome plated door handles; interior: mottled vitreous enamel.

Hob: Heavy gauge sheet steel pressing. To remove, lift front and pull forward. Fig. 2 shows top of range with hob removed.

Fuses: Below hob. Accessible by removing hob and fuse cover. Fig. 2.

Main Terminals: At rear of range below oven. Accessible by removing self tapping screw from front panel under oven door, and sliding panel downwards. Fig. 3 shows panel removed.

Hotplates: Radiant or cast 8" and 6 $\frac{1}{4}$ " dia. Cast griller hotplate 10" x 8". Plug-in E.D.A. (British Standard) fitting. Fig. 2 shows hotplate removed after detaching hob.

Oven Elements : Bottom element only, thermostatically controlled. Terminal connected. To remove, unscrew two self tapping screws securing element assembly to rear wall of oven, loosen two self tapping screws locating front of element to bottom of oven. Pull element forward and disconnect conductors from terminals. Fig. 4.

Switches, "Simmerstat", Oven Thermostat and Pilot Lamp: Located on splash back. To replace switches, etc., remove all knobs, switch locknuts, hob, and two screws at lower corners of splash back. Lift off splash back. Fig. 5 shows splash back and switch removed.

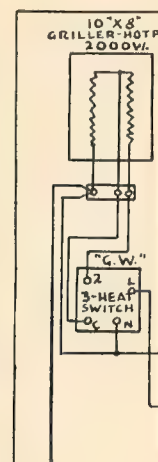
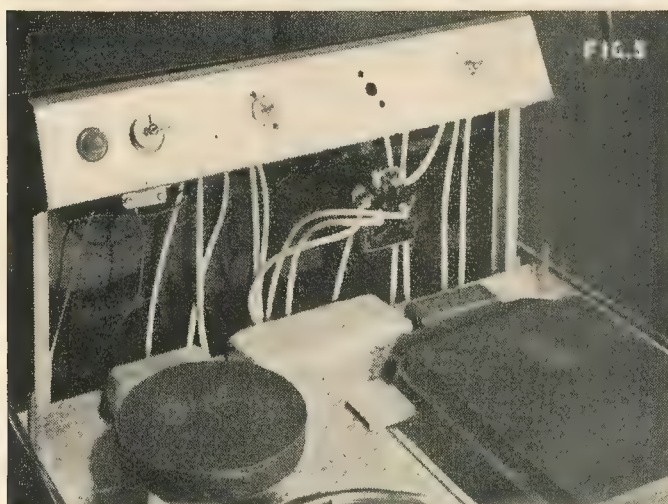
Oven Door: Drop type. Springs accessible by removing panel below oven door. Fig. 3. Door can be detached by removing springs and side panels.

Griller Door: Drop type. Springs accessible by removing side panels.

Oven Vent: Along top inside edge of oven door.

Wiring: Asbestos covered heat resisting wire. Accessible by removing splash back and rear panel. Fig. 6 details wiring diagram.

Other Features: Separate grilling compartment. Inner and outer sections of 8" dia. Radiant hotplate can be individually switched "on" by 4-heat switch.



"DAVELL" C
FIG. 6

Oven Elements—Bottom element only, thermostatically controlled. Terminal connected. To remove, unscrew two self tapping screws securing element assembly to rear wall of oven, loosen two self tapping screws locating front of element to bottom of oven. Pull element forward and disconnect conductors from terminals. Fig. 4.

Switches, "Simmerstat", Oven Thermostat and Pilot Lamp—Located on splash back. To replace switches, etc., remove all knobs, switch locknuts, hob, and two screws at lower corners of splash back. Lift off splash back. Fig. 5 shows splash back and switch removed.

Oven Door—Drop type. Springs accessible by removing panel below oven door. Fig. 3. Door can be detached by removing springs and side panels.

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switch

red scale shall be set to 2 hrs. mins. Note: Knobs may be turned in any direction when pushed in.

Set thermostat controls and selector switch where fitted. Place food in oven and close door. When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during pre-heating.

The oven will automatically switch on at 11.30 and off at 1.45.

Use of "Oven Timer" to Switch "On" Only.

Check electric clock against correct time. Alter clock hands if necessary by turning white knob in centre of dial.

Push in black knob to set "Start Cooking" dial to same time as indicated by clock hands. Black knob will then snap forward.

Set red (Cooking Time) scale to the desired time period. Note: Knobs may be turned in either direction when pushed in.

Set thermostat controls and selector switch where fitted. Place food in oven. Note: When cooking in above manner in ovens with top heating, top element should generally not be used as food would become scorched during heating.

However, oven can be pre-heated with top element before placing food in oven if so desired.

The oven is now switched "on" and will automatically switch "off" at the end of period as indicated on "Cooking Time" scale.

Manual Control.

Check electric clock against correct time. Alter clock hands if necessary by turning white knob in centre of dial.

SECTION 2.

ITEM NO. 54 RODEN "CHEFMASTER" UPRIGHT CABINET 3-HOTPLATE RANGE.

General Construction: Streamlined sheet metal.

Finish: Vitreous enamel. Plastic switch knobs. Chrome full-width handles and trims. Mottled vitreous enamel interior.

Hob: Heavy gauge steel pressing, permanent fixture. Splash back incorporates control switches.

Fuses: Above switch control panel, accessible by sliding cover strip forward, Fig. 2.

Main Terminals: At rear, accessible by removing third top section of back panel. Fig. 4.

Hotplates: In special pans suspended from hob. Terminal connected. To remove, open oven door, remove drip tray from under hotplate and unscrew clip located below hob. Raise front of hotplate pan and carefully withdraw. This exposes hotplate terminals. Fig. 2. It is necessary to remove the front left hand hotplate before removing rear hotplate. When replacing a hotplate feed the wiring back through the saddles on the underside of hob as far as possible to avoid any possibility of wiring fouling drip tray.

Oven Elements: Plug in connections with earth-pin. Fig. 3.

Top Oven Element: To remove, detach screw or pin from front lug, drop front of element and pull forward.

Lower Oven Element: Similar to bottom oven element.

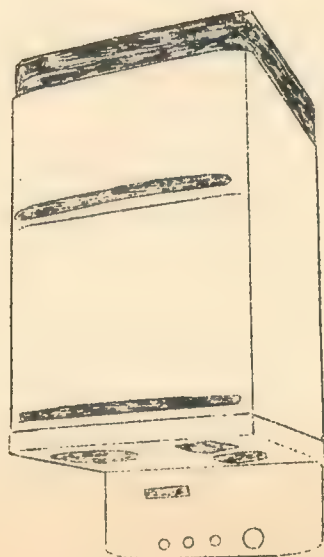
Switches and Thermostat: Located on splash back. To replace 3 - and 6-heat switches, remove fuse cover, switch knobs from hotplates, switches and top back panel. Remove screws with fibre washers located at end of fuses, and lift splash back clips clear of hob. The external resistors for 6-heat switches are located at rear of lower oven and are accessible from the back after removing lower panel. To replace thermostat, remove top back panel, thermostat knob and two screws, screwing thermostat to switch panel. To remove single hob switches and pilot lamp for lower oven, push through from rear of panel. Fig. 4 shows back panel removed.

Oven Vent: Under left hand side hotplate.

Oven Door: Drop type. Special tools required for removing door.

Wiring: 1/.064" asbestos covered wire. Accessible after removing vent panels. Fig. 4.

Wiring diagram, Fig. 6.



Section 2.

ITEM NO. 55 - MITERS "K.F.B." ELECTRIC RANGES - L75 UPRIGHT AND E75 ELEVATED MODELS

General Construction - Streamlined sheet metal.

Finish - Exterior: vitreous enamel, plastic handles and switch knobs with metal trims. Interior: dark blue vitreous enamel.

Hob - Heavy gauge sheet steel pressing. Hinged at rear; splash back secured to rear of hob under two clips. Fig. 3 shows hob raised.

Fuses - Under hob, front left hand side. Accessible by lifting hob, removing screw at top of fuse box and opening hinged lid. Fig. 3.

Main Terminals - Model L75: at rear. Accessible by removing left hand side panel; to remove panel, raise hob and unscrew two screws on top of side panel. Fig. 4. NOTE: Rear panel must not be removed. Model E75; at rear, accessible by removing cover plate. Fig. 5.

Hotplates - 8" and 6 $\frac{1}{2}$ " dia. radiant, plug-in type. Griller-hotplate 10"x8" cast, plug-in type; E.D.A. (British) standard plug-in connections. Fig. 3.

Oven Elements - Tubular side heating elements only; plug-in type. Accessible after removing side baffles. Fig. 6.

Switches, "Simmerstat", Thermostat and Pilot Lamp - Behind left and right hand front switch panels Model L75; to replace switches for radiant hotplates remove left hand side panel. Fig. 4. To replace oven thermostat, pilot lamp, and switch for griller-hotplate, remove right hand side panel, front switch panel and switch mounting bracket. Model E75; to replace switches for radiant hotplates, remove front left hand switch panel and switch mounting bracket. To replace oven thermostat, pilot lamp, and switch for griller hotplate, remove front right hand switch panel and switch mounting bracket. Fig. 7 shows front switch panels removed. NOTE: when replacing the thermostat on E75 models it is necessary to remove the top panel at rear of oven, the main terminal cover, and recessed panel at side of mains terminals.

Oven Door - Drop type with spring mechanism below oven door. Model L75: accessible by detaching lower front panel. Fig. 8. Model E75: accessible by opening cupboard door below oven, or removing lower front panel strip from range. Fig. 9. NOTE: panel strip is clipped on to front of range.

Griller Door - Drop type. In model L75 spring mechanism accessible by removing right hand side panel; in model E75, front right hand switch panel and switch mounting bracket.

Vent - Through oven door.

/RM.

SECTION 2.

ITEM NO. 56 - "WESTINGHOUSE" MODELS C126 UPRIGHT CABINET 3-HOTPLATE, C127 UPRIGHT CABINET, FULLY AUTOMATIC, 3-HOTPLATE, C155 ELEVATED, 3-HOTPLATE, C157 ELEVATED, FULLY AUTOMATIC, 3-HOTPLATE.

General Construction: Streamlined sheet metal. Standard C155 and C157 models - right hand oven; special C155 and C157 models - left hand oven.

Finish: Exterior: vitreous enamel, chrome-plated handles and plastic switch knobs.

Interior: Dark blue vitreous enamel.

Hob: Heavy gauge sheet steel pressing. Located at rear by two pins and secured in front by push-in spring clip. To remove, lift front from clip and slide forward. Fig. 3 shows hob removed.

Fuses: Accessible by removing hob. (Fig. 3.)

Main Terminals: At rear of range, below hob. Accessible by removing hob, and cover plate located between fuses. (Fig. 3.)

Hotplates: Plug-in connections with earth pin. (Fig. 3.)

Oven Elements: Top and bottom plug-in connections with earth pin. (Fig. 4.)

Switches, "Simmerstat" and Thermostat: To replace, remove all knobs, front switch panel and mounting panel. (Fig. 5.)

Note: When replacing thermostat, to gain access to tube also remove panel from rear of oven on C126 and C127 upright models (Fig. 6.), and on C155 and C157 elevated models, remove panels at rear of oven and hotplates.

MERS MINDERS

(page 11)

the dial. The timer show the correct black indicator with rotate as long as is maintained. If off, however, the and hands will need supply is restored. The oven timer also smaller dials, one red, both graduated quarter hours. The marked "Start" indicates the time at which to start cooking set by turning the

marked "Cooking" the length of cooking required. It is set by the knob. Note: It is in which direction the knobs are turned. The push button knob control only.

Automatic Timer to and "Off."

requires 2 hours and is to commence

the electric against the clock hands if turning white knob

the black knob in as far as to turn the black dial until 11.30 is reached.

the red knob and set the (Cooking Time) dial to 2 hours. It is necessary to add the normal cooking time of the oven. This is according to type of oven. If it is 15 minutes,

then 15 minutes. Turned the push button (iv) oven. Place Note: The timer is an element used during (v) the switch.

(c) Use of "OFF"

(i) The correct necessity centre (ii) black time The black ward. (iii) to the Knob direct (iv) oven and push cooking with should food pre-heating. Howe with food (v) The and valve at end "Cool

(d) Manual

(i) The correct necessity in cer

ITEM NO. 58 - "CARMICHAEL" ELECTRICALLY CONTROLLED GAS RANGES,
MODELS NO.27 AND NO.57.

GENERAL:

The electrical control system is designed to operate on 230-240V 50 cycles. Total current drawn is 0.3 amps at 240V.

The Timers and Minute Minders fitted to these ranges are of Smiths design and are the same types as those fitted to "Westinghouse" automatic electric ranges.

OVEN GAS SYSTEM:

The Oven Gas System is shown in the appendix.

The function of the automatic control system is to turn gas on into the oven and ignite it at a pre-selected time, and at a second time turn the gas off.

In order to accomplish this, gas is passed from the thermostat located on the Range Manifold to the safety cut-out. The purpose of the safety cut-out is to immediately shut off all gas to the oven, including pilot, in the event of the pilot going out. By this means, safety in the oven is assured, as no gas can pass to the oven until the pilot is re-lighted.

The method of lighting this pilot is detailed in the Operating Instructions. After lighting the pilot, adjusting the thermostat to the temperature required, and setting the Automatic Timer, gas is allowed to flow to an electric/Gas Solenoid operated at pre-set times by the Time Clock, and from the Solenoid to the Oven Nipple.

The oven pilot gas supply is made by a separate supply line which also passes through a section of the safety cut-out and thence by its own control cock to the Oven Pilot. The pilot cock is located in the back of the Grill Chamber and is screw driver operated. The pilot gas does not pass through the thermostat.

It will be clear from the foregoing and reference to the diagram that, with the oven pilot alight and the thermostat set, gas will be turned on and off by the time clock.

The Safety Control is of the thermocouple type and cannot become mechanically stuck. This control has an electrical circuit built within itself and generates its own actuating current, but has no connection with the 230-240V AC power supply.

ELECTRICAL SYSTEM:

The Electrical System is shown in the appendix.

There are two electrical circuits on the range:

(Over)

- (a) Time Clock - Gas Solenoid Circuit.
- (b) Oven Light Circuit.

TIME CLOCK - GAS SOLENOID CIRCUIT.

The active load of this circuit is connected to No.2 of the group of four terminals, with the same active looped over to No.5 terminal at the clock motor.

The second terminal of the Clock Motor is returned to the No.4 of the four clock terminals, which is also connected to the neutral "N" terminal at the Terminal Block.

The No.1 clock terminal is connected to one lead of the solenoid winding, whilst the other lead of the solenoid is connected back to the neutral - No.3 terminal.

Current for the synchronous motor of the time clock must not pass through any switches within the range as the clock is intended to operate 24 hours of the day.

OVEN LIGHT CIRCUIT:

The active terminal "A" of the Terminal block is connected to the oven light switch and the other terminal of the switch to one terminal of the oven light socket. The second oven light terminal is connected back to the terminal block neutral terminal "N". The third terminal "E" on the terminal block is Earth.

Oven Light: The oven light switch is located at left-hand end of control panel. Press to light oven. Press second time to turn off. The oven light may be used when door is either open or closed.

Knobs. Finishing Time Knob (Top). Selector Knob (Centre with Letters) Length of Cooking Time Knob (Bottom Red Dot).

The letters on the Selector Knob are "M" for Manual Operation, "O" for Off, "C" for Cooking, "A" for Automatic. The knob should be turned so that the position required is at the top. When the range is set to Automatic the knob will switch to "C" for cooking when the time control has begun to operate.

METHOD OF OPERATION OF OVEN:

The oven may be operated -

- (a) Automatically - on Time Clock.
- (b) Manually.
- (c) In Emergency - Gas Only.

In either (a) or (b), light the pilot located at the left hand end of the main burner at the back of the oven, at the same time

holding the pilot lever (reached by opening flap below burner cocks) to the right for approximately 30 seconds. If the pilot lever is released too soon, the pilot will go out. This period of time is necessary for a thermo-couple located near the pilot flame to be heated sufficiently to produce the small voltage required for the solenoid of the Oven Safety Control to retain the control in the open position in which it has been placed by operating the pilot lever.

The oven pilot-cock is in the "ON" position when the range is delivered and should be left on permanently.

If necessary, the gas to the oven pilot may be turned off by a control cock located beneath the right-hand rear aeration pan behind the grill chamber and operated by a screwdriver. "ON" is slot across, "OFF" is slot upright.

(a) Automatic Operation.

1. Plug into General Purpose Outlet and switch on.
2. Check for correct time on Clock.
3. Light the pilot, ensuring that it stays on by holding the pilot lever hard right for 30 seconds.
4. Set the time at which the meal will be required, on the Finishing Time Knob (top knob.)
5. Set the period of time required for cooking the food by adjusting the Cooking Time Knob (bottom knob.)
6. Turn the Selector Knob to "A" for Automatic - i.e., "A" on top.
7. Set the thermostat to the desired cooking temperature.

(b) Manual Operation.

When it is desired to use the oven manually (that is, by personally controlling the oven - not by means of Time Clock) turn the Selector Knob to "M". With the controls in this position the range is electrically controlled to manual. Operate the oven as if the range had no Time Clock.

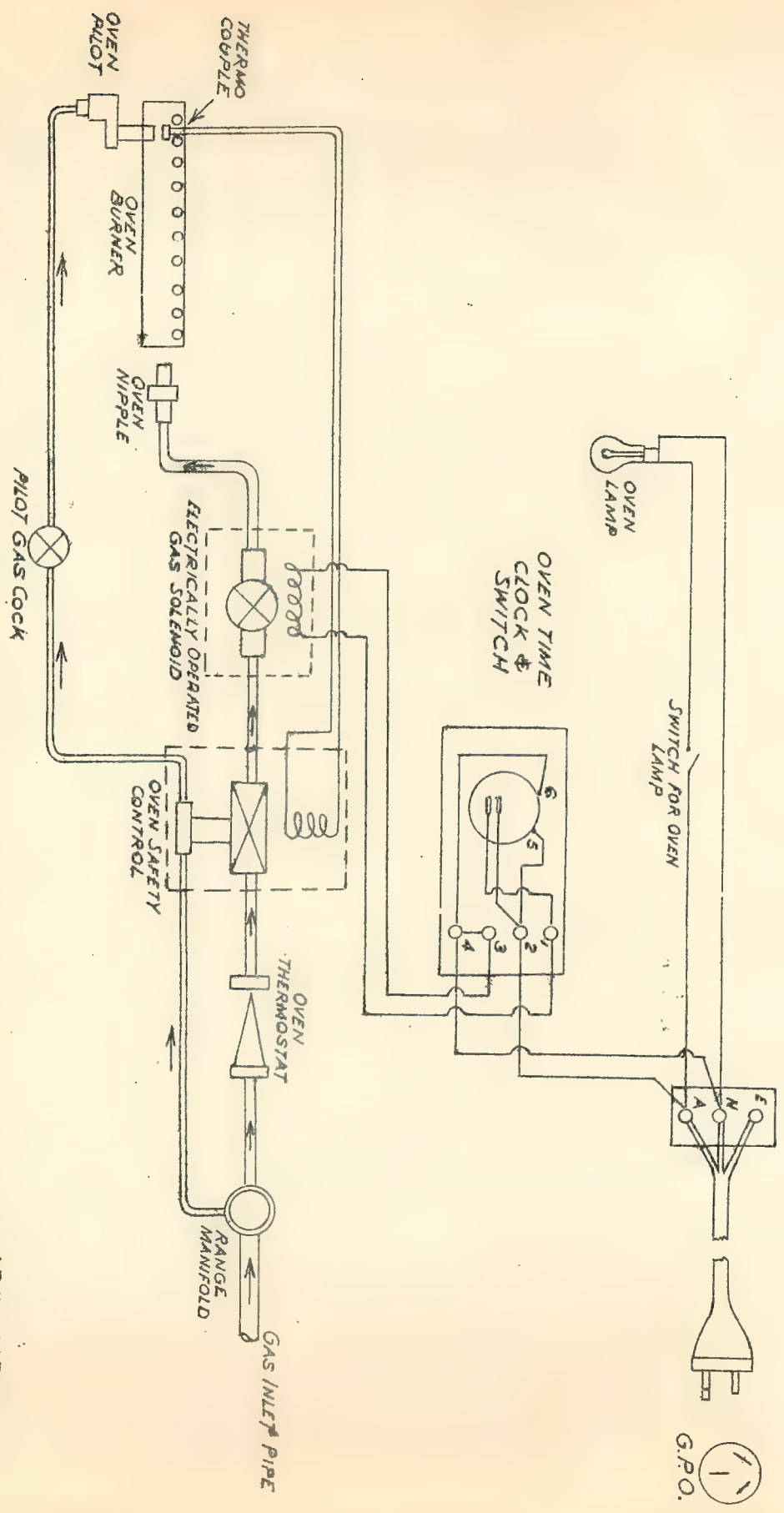
(c) Emergency Operation.

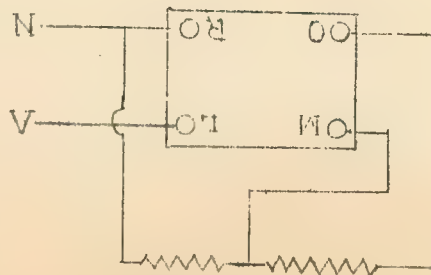
Emergency can be electricity supply interruptions, electrical installation defects, or electrical defects in the range itself. In such cases, the oven will go off. To enable cooking to proceed, turn the Emergency Lever (located under the Pilot Lever in the grilling compartment) to "M" when the oven burner will come on. The Emergency Lever should at all times, other than emergencies, point to "A" (for automatic) on the support plate.

Should the interruption occur during time-clock cooking, the clock should not be altered until cooking is completed as the clock will automatically adjust the finishing time, but the completion of cooking will be later by the duration of the interruption.

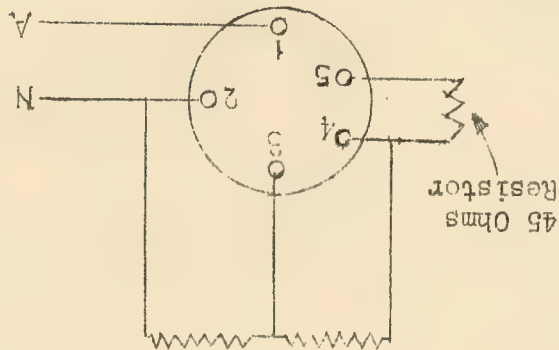
"CARMICHAEL" ELECTRICALLY CONTROLLED GAS RANGE

APPENDIX

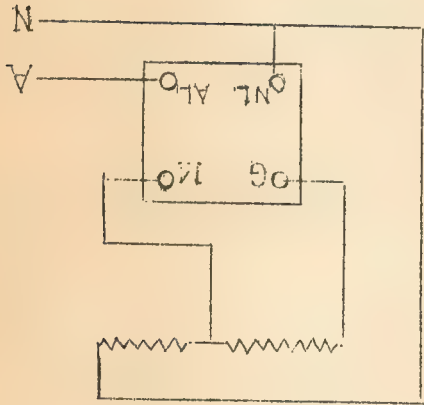




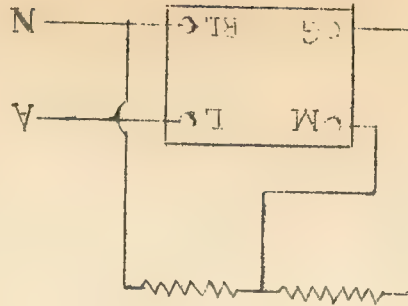
"Arrow" 3-Heat Single-Pole



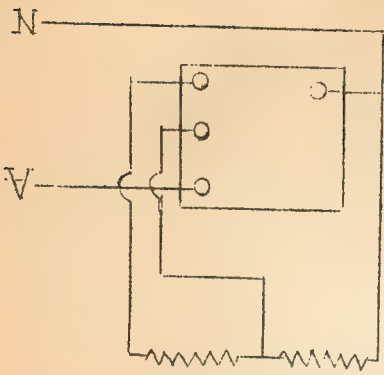
Arrow 9978 4-Heat



Ogden 3-Heat Single Pole

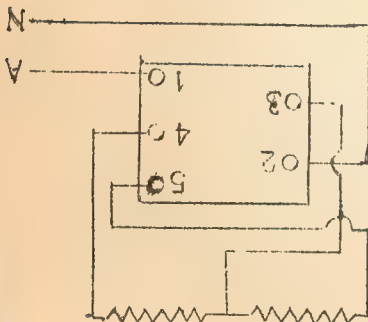


Magnol 3-Heat



Diamond H 3-Heat

"Arrow" 9999, 3-Heat Double-Pole



SECTION 2.

ITEM NO.60 - "ST. GEORGE" RANGES.

"CONSTELLATION" AND "SUPERMATIC" MODELS.

General Construction: Streamlined sheet metal.

Finish: Exterior: Vitreous enamel, plastic switch knobs with chrome surrounds. Chrome handles and trims.
Interior: Mottled vitreous enamel.

Hob: Heavy gauge steel pressing, permanent fixture.

Fuses: "Constellation": Behind nameplate on switch panel. Accessible by removing two thumb screws. Fig. 3.
"Supermatic": Access by removing left hand side utility drawer. Fig. 4.

Main Terminals: At rear, on both models. Accessible by removing cover plate in lower back panel. Fig. 5.

Hotplates: 8 in. dia. and $6\frac{1}{2}$ in. dia. radiant, hob mounted. Secured to hob with folding clips. Hotplates are accessible for disconnection after raising hinged heating section, detach reflector pan, and fold back clips. Fig. 3 shows hotplate removed.

Oven Elements: Top and bottom tubular radiant elements. Plug-in type. Fig. 6. Bottom oven elements also have locating screws in front of element. On both ranges, oven elements are controlled by automatic timer and 2-stage thermostat.

Note: On the "Supermatic" model, both ovens have individual 2-stage oven thermostats which are controlled by a common automatic timer. This means that each oven can be used automatically or manually, either separately or together, i.e., one oven cannot be used automatically and the other manually.

Switches, Thermostats, Timers, Neon Pilot Lamps, etc.: Located on splash back on both models. To replace switches, etc., remove top back panel. Figs. 5 and 7 show panels removed.

Oven Lights: To replace lamps, lift up glass cover in oven with flat side of table knife, move bottom forward and glass cover will then slide out. Screw out defective lamp and replace. Fig. 6.

Oven Vents: "Constellation" model: Through centre of front hotplate.
"Supermatic" model: Through rear of ovens. Fig. 7.

Oven Doors: Drop type, with glass windows on both models. Spring mechanism below front of ovens. "Constellation" model: spring mechanism accessible by tilting range backwards, remove two screws and detach front section of plinth, and unscrew two nuts one at each end of lower front panel and remove same. - Fig. 8.

(Over)

Oven Doors (Cont'd.)

"Supermatic" model: spring mechanism accessible by removing panel held by press-on clips below ovens, and removing utility drawers - Fig. 4.

"Rotisserie" or "Barbecue": Located in left hand side oven on "Supermatic" models only. Fig. 9. The "Rotisserie" set, or frame for holding meat is driven by a geared motor located at rear of oven, Fig. 7, and can be detached from motor drive by lifting front handle and pulling forward.

Wiring: Asbestos covered heat resisting wire. Accessible by removing both rear panels from ranges. Figs. 5 and 7.

Wiring Diagrams: "Constellation" model Fig. 10.
"Supermatic" model Fig. 11.

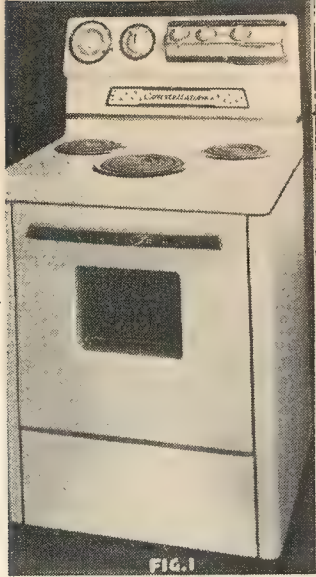


FIG. 1



FIG. 2



FIG. 4

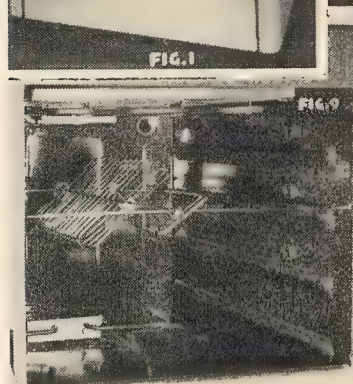


FIG. 3



FIG. 5

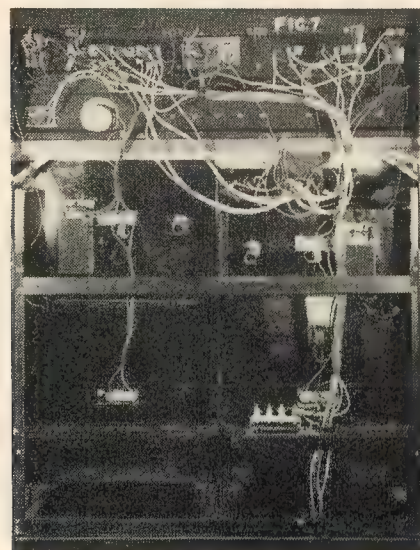


FIG. 7

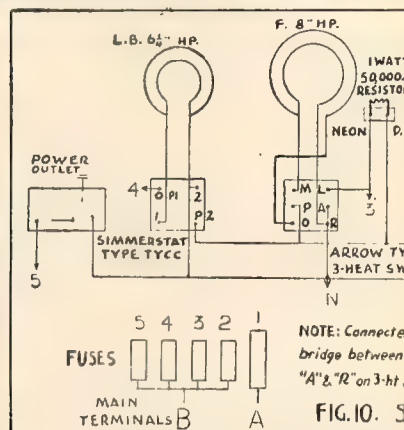


FIG. 10. S

Other Features — Both models. Separate removable drip tray under hotplates. Accessible by opening oven door, Fig. 3. Power point outlet, smokeless griller. Minute ringer timer fitted to "Supermatic" model only. "Constellation" model has single Neon pilot lamp to indicate when any of the hotplates are switched on. "Supermatic" model has separate pilot lamp for each hotplate.

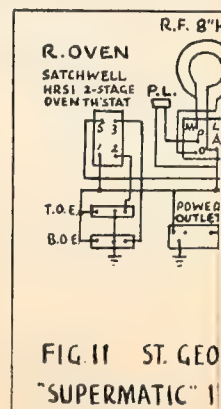


FIG. 11 ST. GEO
"SUPERMATIC" I

TIMERS E MINDERS

(page 11)

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ITEM NO. 61 "WESTINGHOUSE" STREAMLINED SHEET METAL RANGES.

C326, Upright cabinet, 3-hotplate (Fig. 1).
C327, Upright cabinet, fully automatic, 3-hotplate.
C355, Elevated, 3-hotplate.
C357, Elevated, fully automatic, 3-hotplate.

Rating at 240 V: 8.2kW, 34.16 amps.

Terminal Loadings: O.A. 15.0 amps.
H.A. 19.16 amps.

Hotplates: Front 8 in. dia. 2100 W. Radiant (S)
Left 6 $\frac{1}{4}$ in. dia. 1250 W. Radiant (S)
Right 6 $\frac{1}{4}$ in. dia. 1250 W. Radiant (S)

Oven Elements: Top 2200 W. (T).
Bottom 1400 W. (T).

Automatic Oven Timer and Ringer Timer: Fitted to C327 and C357 models. Selector switch on oven timer marked "M" manual, "O" off, "C" cook, and "A" automatic.

LEGEND: (S) Simmerstat control. (T) Thermostat control.

General Construction: Streamlined sheet metal. C355 and C357 models available with either right-hand or left-hand ovens. Oven doors fitted with double armour-plate glass windows on all models. The above models are identical generally with similar models as detailed in Item No. 56, with the following modifications:-

1. Hob - Fixed in position.
2. Fuses - Mounted on splash back. Accessible by removing two thumb screws and detaching cover strip (Fig. 2)
3. Hotplates - Three "Corox" radiant, hob mounted, with silver-plated contacts.

To remove heating coil, reflector, and spillage tray:

- (i) press front edge of coil towards rear of range, lift upwards and pull forward (Fig. 2);
- (ii) lift out reflector from hob-mounted rim, and spillage tray from below hob opening (Fig. 3).

CAUTION: Never immerse "Corox" heating coils in water for cleaning etc.

4. Hotplate spring contact strips are located in steatite blocks under hob at rear of hotplate and are secured to brackets with screws and nuts.

To replace contact strips:

- (i) 8" dia. hotplate - accessible from hob opening for removal after detaching heating coil, reflector and mounting ring which is clipped on to hob;
- (ii) $6\frac{1}{4}$ " dia. hotplates - remove panel from rear of splash back (Fig. 4.)

SECTION 2.

ITEM NO. 62 - "DAVELL" RANGES.

MODELS C6 - 2, 2 Hotplates

C6 - 3, 3 Hotplates (Fig. 1).

General Construction: Streamlined sheet metal.

Finish: Exterior: Vitreous enamel, plastic switch knobs and chrome plated door handles.

Interior: Mottled vitreous enamel.

Hob: Heavy gauge sheet steel pressing, hinged at rear; splash back secured to rear of hob under two clips. Fig. 2 shows hob raised.

Fuses: Behind griller door under compartment; accessible by opening griller door and removing cover plate. Fig. 3.

Main Terminals: At rear of range; accessible by removing lower panel. Fig. 4.

Hotplates: Radiant or cast 8" and 6 $\frac{1}{4}$ " dia. Cast griller hotplate 10" x 8", plug-in E.D.A. (British Standard) fitting. Fig. 2 shows hotplates removed after raising hob.

Oven Elements: Thermostatically controlled; bottom element only, radiant type, terminal connected. To remove, unscrew two self tapping screws securing element assembly to rear wall of oven interior, loosen two self tapping screws locating front of element to bottom of oven, detach front baffle, pull element forward and disconnect conductors from terminals. Fig. 5.

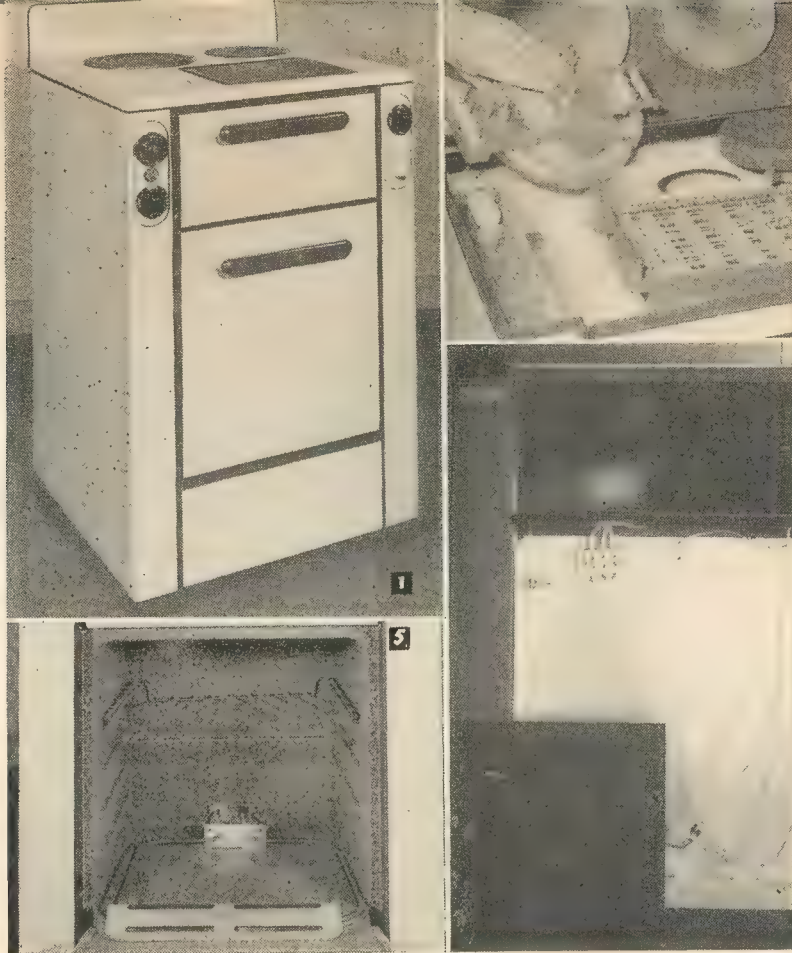
Switches, "Simmerstat," Oven Thermostat, Pilot Lamp: Mounted on small detachable panels at each side of the griller door. To replace switches, etc., raise hob, loosen self tapping screw located above switches and detach panel assembly from front of range. Fig. 6.

Oven Door: Drop type; springs accessible by unscrewing two self tapping screws and removing panel below oven door. Fig. 7.

Griller Door: Drop type; spring located behind right hand side panel at rear of switches, accessible by raising hob and removing switch panel assembly. Fig. 6

Oven Vent: Along top inside edge of oven door.

Wiring: Asbestos covered heat resisting wire, accessible by removing switch panel assemblies and rear panel. Figs. 4 and 6. Fig. 8 details wiring diagram.



(British Standard) fitting. Fig. 2 shows hotplates removed after raising hob.

Oven Elements — Thermostatically controlled; bottom element only, radiant type, terminal connected. To remove, unscrew two self tapping screws securing element assembly to rear wall of oven interior, loosen two self tapping screws locating front of element to bottom of oven, detach front baffle, pull element forward and disconnect conductors from terminals. Fig. 5.

Switches, "Simmerstat," Oven Thermostat, Pilot Lamp — Mounted on small detachable panels at each side of the grill door. To replace switches, etc., raise hob, loosen self tapping screw located above switches and detach panel assembly from front of range. Fig. 6.

Oven Door — Drop type; springs accessible by unscrewing two self tapping screws and removing panel below oven door. Fig. 7.

Grill Door — Drop type; spring located behind right hand side panel at rear of switches, accessible by raising hob and removing switch panel assembly. Fig. 6.

Oven Vent — Along top inside edge of oven door.

p. Set this time on the black by turning the black knob. white selector knob to position 1.

When thermostatic controls and switch where fitted, place food in oven and close door.

(c) When cooking in above ovens with top heating, top element should generally not be used as food would become scorched without pre-heating. However, oven should be pre-heated with top element before placing food in oven if so directed.

When cooking period is finished, oven will automatically switch "off" as detailed in clause (ii) para. (g).

Control of Oven

When from Automatic Oven Timer to Hand Control, press the selector knob and it will move to position No. 1. This knob must always be in position No. 1 when not using automatic cooking.

Wiring Diagrams

Wiring of connecting "Smith Oven" may differ according to the type of oven to which they are fitted, therefore manufacturer's wiring diagram should be referred to when required.

Alarm Timer (Minute Minder).

Alarm timer is operated by clockwork, connected to the electrical circuit. It is an interval timer and emits a ringing (approx. 6 seconds) at the pre-set time for two minutes.

The alarm is graduated in minutes from 1 to 15 and the small window indicates the time to "4." The setting pointer is so winds the clock and alarm. When set, the alarm will ring.

The setting pointer is turned in a clockwise direction to the required setting, giving one full revolution every hour, and for every additional minute, turning it to the appropriate mark on the dial.

SECTION 2.

ITEM NO. 63 - "RODEN" RANGES.

"44" UPRIGHT CABINET MODEL, 2 HOTPLATE.

General Construction: Streamlined sheet metal,

Finish: Exterior: Vitreous enamel hob, splash back, and front panels; baked enamel side panel.

Interior: Mottled vitreous enamel. Plastic switch knobs, chrome plated door handles and trims.

Hob: Heavy gauge pressed sheet steel, hinged at rear; detach splash back from brackets before raising hob. Fig. 2.

Fuses: Behind lower front panel, under oven door; accessible by removing two self tapping screws from lower edge of panel and sliding panel downwards. Fig. 3.

Main Terminals: Behind right hand side panel. Fig. 4.

Hotplates: 8" dia. radiant, hob mounted; hinged from bracket screwed to edge of hob opening.

To replace heating coils:

- (a) lift hotplate and remove reflector pan;
- (b) spread and disengage link on which hot-plate section is hinged from bracket on hob opening;
- (c) remove metal band and spring slips from each end of porcelain terminal block;
- (d) detach terminal block and disconnect conductors. Fig. 5.

After replacing element, adjust link and flexible conduit to ensure hotplate sits down correctly.

Griller-hotplate: 10" x 8" cast plug-in type; E.D.A. (British) standard; accessible after lifting hob. Fig. 2.

Oven Elements: Top and bottom plug-in connection, with 2 stage thermostat control; elements are interchangeable.

Top oven element: to remove, unscrew self tapping screw from left hand side of element and drop down wire guard; slide element to the left to disengage pins from socket.

Bottom oven element: to remove, unscrew self tapping screw from front edge, and nut from earthing lug at right hand rear of bottom oven element cover; slide cover out; remove element retaining screw, and slide oven element to the left to disengage pins from socket. Fig. 6.

Oven Thermostat, 3-heat Switches, and "Simmerstat" - Located down right hand side of oven behind right hand side panel. To detach side panel, remove screws from rear edge of panel, pull panel clear at rear of range and slide forward. Fig. 4 shows panel removed.

Oven Vent: Through top of oven into grilling compartment. Fig. 2.

Oven Door: Drop type with ajar position for grilling; spring mechanism accessible by removing side panels. Fig. 4.

Griller Door: Drop type with counterweights on each side behind side panels. Fig. 4.

Wiring: Asbestos covered heat resisting wire; accessible by removing right hand side panel. Fig. 4. Wiring diagram detailed in Fig. 7.

Rating at 240V.

6.85kW., 28.5 Amps

Terminal Loadings

O.A.

11.6 Amps

H.A.

16.9 Amps

Hotplates at 240V.

Right - 8" dia. "A.E.I Minitube Hispeed"
2050W. Radiant (3) or (S)

Left - 10" x 8" 2000W. Cast Griller Hotplate (3)

Oven Elements at 240V.

Top

1400W.

Bottom

1400W.

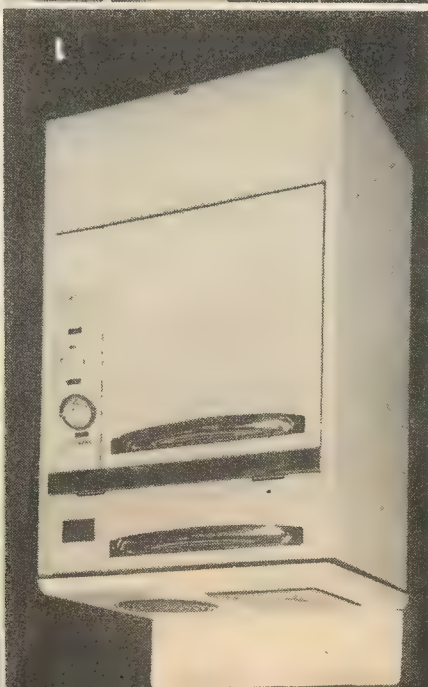
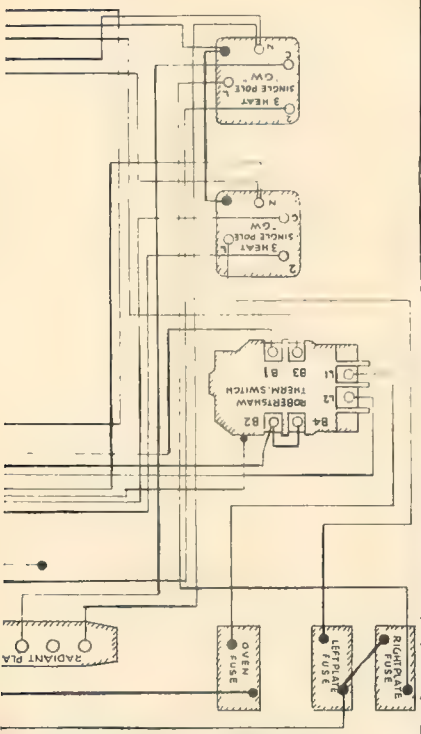
(T)

Oven Dimensions - $13\frac{5}{8}$ "W. x 14"D. x $12\frac{5}{8}$ "H.

Overall Range Dimensions: Height from floor to top of hob, $36\frac{1}{4}$ ". Width, $32\frac{1}{2}$ " Depth, 17". Height of splash back, $5\frac{3}{4}$ ".

Legend: (3) 3--heat switch control, (S) Simmerstat control, (T) 2 - stage thermostat control.

RODEN "44" RANGE WIRING DIAGRAM FI



AUTOMATIC TIME AND MINUTE

(Continued from page

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time and the black
white line will ro
supply to range is
supply is turned o
clock will stop and
re-setting when sup
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which it is desired
the meal. This is se
black knob.

The red scale ma
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red and black knob
The chrome plated p
is for manual contr

(b) Setting the Autom Switch "On" and

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cooking time and i
cooking at 11.30.

(i) Check electric
correct time. Alter
necessary by turni
in centre of dial.

(ii) Push the black
as possible and ti
(Start Cooking) dial
opposite the pointer.

(iii) Push the red
the red (Cooking Ti
hours. It will be ne
extra time to the n
time for heating th
time varies accordi
range. Assuming it

SECTION 2.

ITEM NC. 64 - U.M.I. "Exeter" Ranges.

Upright Cabinet 2 Hotplate (Fig. 1.).

Elevated 3 Hotplate, (Fig. 2).

General Construction: Streamlined sheet metal.

Finish: Exterior: vitreous enamel, chrome plated handles and plastic switch knobs;

Interior: Mottled vitreous enamel.

Hob: Heavy gauge sheet steel pressing hinged at rear, not intended to be readily opened for cleaning. To raise, remove splash back, two screws under front and one under centre of hob.

Note: On elevated models, first pull out stainless steel trim from between side of hob and oven. Fig. 3 shows hob raised and supported.

Fuses: Upright model: at rear of grilling compartment; accessible by removing cover plate. Fig. 4.

Elevated model: behind switch panels, in front of range. Fig. 5 shows panels detached.

(a) Where panels secured by screws and clips:
remove screws and pull panel forward to detach from clips.

(b) Where panels secured by clips only:
move range forward on cabinet until lower edge of panels is clear of cabinet;
pull top of panels clear of clips, and lower panels to disengage from bottom clips.

Main Terminals. Upright model: at back of range; accessible by removing rear panel. Fig. 6.

Elevated model: behind switch panel below hotplate section; for access, remove switch panel and terminal cover. Fig. 5.

Hotplates. 8" dia. and 6 $\frac{1}{2}$ " dia. radiant, hob mounted, terminal connected; secured to hob with folding clips. 10" x 8" cast grillor hotplate, terminal connected. Fig. 3.

Oven Elements: Top and bottom radiant with screw terminal connection; thermostatically controlled. To remove elements, unscrew two screws securing element to rear wall of oven liner, and loosen two screws locating front of element. Withdraw element terminals into oven. Fig. 7. Refit baffle to front of bottom oven element before tightening screws.

Switches, Thermostat, Etc. Upright model: at rear of range with extension rods to knobs at front; accessible after removing left or right hand side panels. Fig. 6.

Elevated model: Switches, pilot lamp in front of range; accessible after removing front panels. Fig. 5. Thermostat is at rear of range with extension rod to knob at front; for access to thermostat, remove panel from rear of oven.

(Over)

Note: Some upright models known as fully automatic type are fitted with "Smith" oven timer, one-hour ring-timer, hob light (strip type), and oven light. These components, with their respective controls, are incorporated in the splash back.

Oven Door: Drop type with spring mechanism below oven. For access to springs: upright model - remove side panels (fig. 6); elevated model - remove switch panel below oven (fig. 5), and open cupboard door.

Grilling Compartment Door: Drop type, with one spring on both models located behind the left hand side panel. Fig. 6. NOTE: For access to spring on elevated model with oven on left hand side, it is necessary to support full length of base of range, detach both switch panels, and remove plates from front and rear of range that join oven and hotplate sections. These sections can now be moved apart and access gained to spring.

Oven Vent: Through oven door under door handle fixings.

Wiring: Asbestos covered heat resisting wire. Wiring diagram, Fig. 8.

Other Features: Separate grilling compartment, smokeless grill pan, and double armour plate glass window in oven door. Left or right hand side oven on elevated models.

SERVICING THE ELECTRIC RANGE

This article is the thirty-first of a series intended to assist readers who are required to service domestic electric ranges.

ITEM No. 65. "METTERS" STREAMLINED SHEET METAL RANGES

L31 De Luxe Upright Cabinet Model, 3-Hotplate, (Fig. 1)

Rating

240V. A.C. only, 8.1kW., 33.75 Amps.

Terminal Loadings

O.A. 14.6 Amps. 2000W. top and 1500W. bottom oven elements.

H.A. 19.2 Amps. One 8 in. dia. 2100W. and two 6½ in. dia. 1250W. hotplates.

A.T.L. "Twinmatic" Timer.
Minute Minder Section used only
as buzzer, does not control hotplate

T.Y.C. "Simmerstat"

"G.W." S.P. 3-heat switches
with screw on spindles

Rating plate and
"S.E." 15x wedge type fuses
behind nameplate.
(Fig. 2)

Main terminals at
rear of oven. (Fig. 4)

Top oven element.
2000W tubular sheathed.
(Fig. 3)

Bottom oven element.
1500W tubular sheathed.
(Fig. 3)

Oven elements removed by
unscrewing screws in plates
securing elements to back of
oven, withdraw element and
disconnect. (Fig. 3)

Remove top back panel for access to wiring, switches,
thermostat timer, etc. (Fig. 4). It is necessary
to remove reflector pans from back hotplates for
access to nuts on screws holding back panel.

"Robertshaw" 2-stage
oven thermostat

"Chromalox" hob mounted
hotplates. (Fig. 2)

Drip tray behind
oven door. (Fig. 2)

Door spring mechanism
behind each side panel. (Fig. 5)

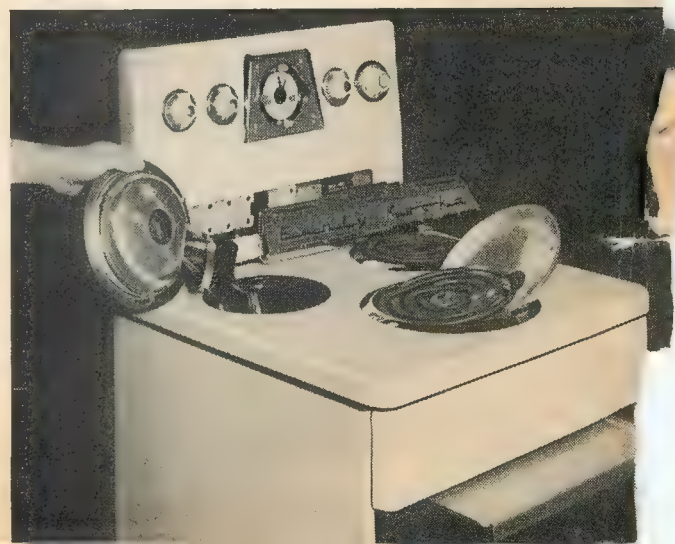


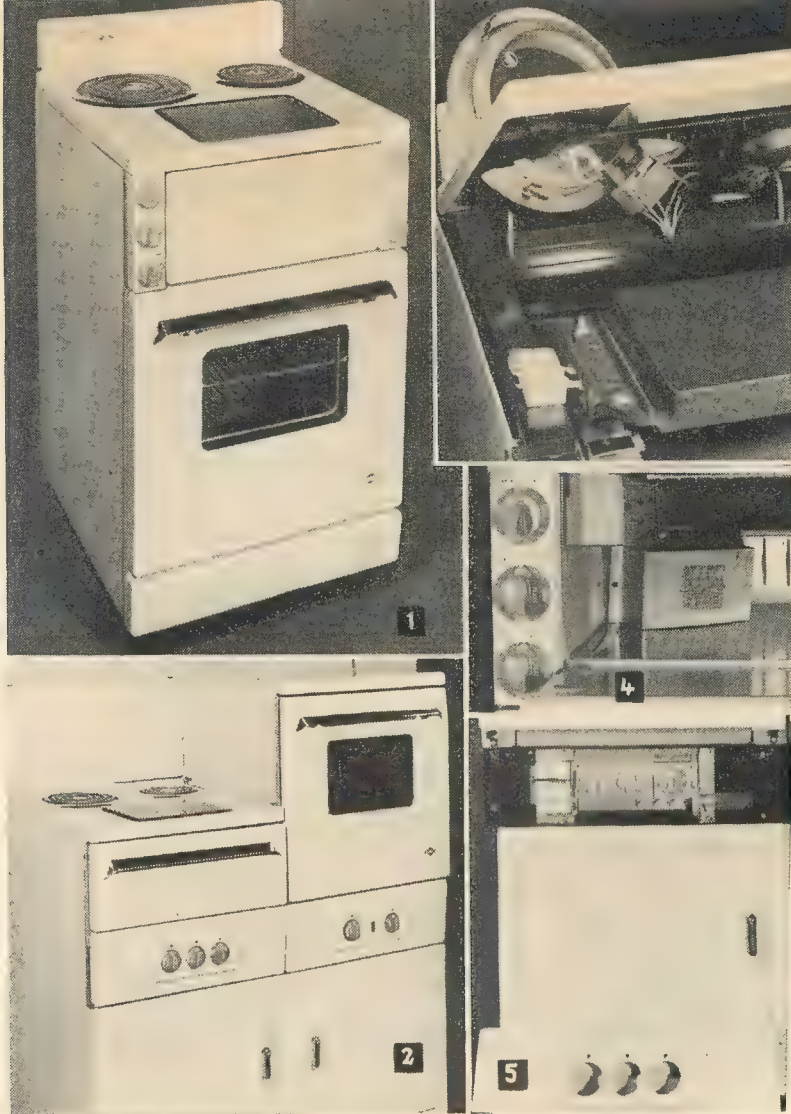
FIG. 1

Fig. 2 (at right). Showing clip-on nameplate removed from fuses, drip tray pulled forward, hotplate reflector detached, and hotplate assembly removed from hob. Hotplate mounting ring secured to hob with folded lugs or push-in clips. T.Y.C. "Simmerstat", or 3-heat switch control.

Removal of side panel:—

- (a) Detach clip-on panels above and below oven door.
 - (b) Detach reflector pans from both 6½ in. dia. hot-
- (continued first column, opposite)





—remove side panels (fig. 6); elevated model—remove switch panel below oven (fig. 5), and open cupboard door.

Grilling Compartment Door—Drop type, with one spring on both models located behind the left hand side panel. Fig. 6. NOTE: For access to spring on elevated model with oven on left hand side, it is necessary to support full length of base of range, detach both switch panels, and remove plates from front and rear of range that join oven and hotplate sections. These sections can now be moved apart and access gained to spring.

Oven Vent—Through oven door under door handle fixings.

Wiring—Asbestos covered heat resisting wire. Wiring diagram, Fig. 8.

Other Features—Separate grilling compartment, smokeless grill pan, and double armour plate glass window in oven door. Left or right hand side oven on elevated models.

(ii) Push in black (Start) time as indicated. The black knob is eliminated.

(iii) Set "Cook" setting. snap forward is eliminated.

(iv) Push the knob in as far as it will go. The oven can now operate by static oven control switch when the minimum plated knob is released will set for automatic time the red set. Thus, the of setting the matic operation oven connects control or over manual operation.

(D) "Midgley-Harmer Mir

(i) Description and operation.
The "minute minute" of a minute sweep indicating number of minutes. The knob above clock hand and scale is switch closes and both the minute hand to "0" position will.

(ii) To set "Minute Minute Power Outlet Control"

(a) Set selector switch is fitted to hotplate or power to control, and switch or power.

(b) Push the white in as far as possible. The white hand will indicate cooking time. large dial and 60 minutes. on

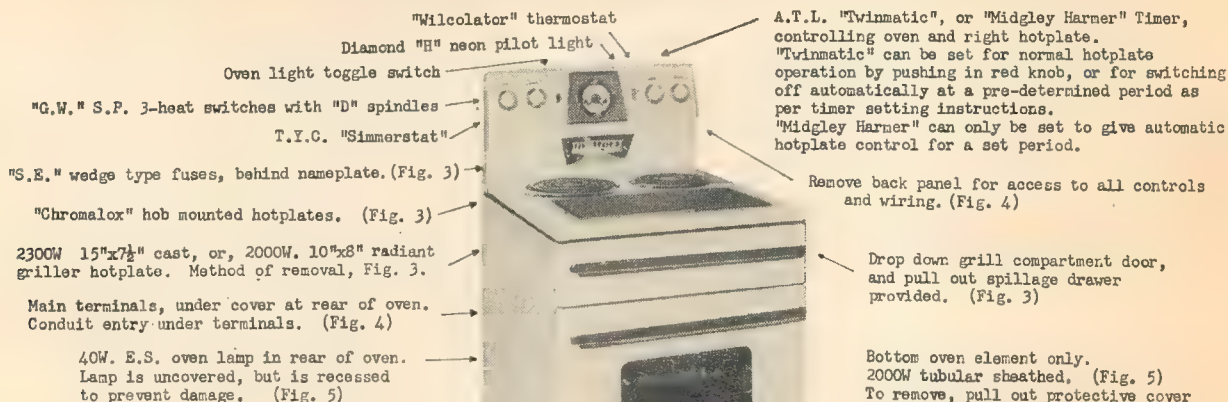
L76 Upright Cabinet Model, 3-Hotplate (Fig. 1).

E76 Elevated Oven Model, 3-Hotplate (Fig. 2).

Rating — 240V., 7.68 kW, 32 Amps.

Terminal Loadings — A. 17.9 Amps. 2000W oven element and 2300W griller hotplate.

B. 14.1 Amps. One 8 in. dia. 2100W, one 6½ in. dia. 1250W, and 40W oven light.



Controls same as L76 model. Refer Fig. 1.

Remove back panel for access to all controls. (Fig. 7)

Main terminals, under cover at rear of oven. (Fig. 7)



Door suspension (Fig. 8) For access to parts, remove front clipped on panel.

FIG. 2
E76

FIG. 1
L76

Fig. 3. (Applicable to both models.) Shows nameplate cover removed from fuses, griller compartment door open pulling tray forward, and hotplate assembly and cast griller-hotplate removed from hob.



The Contactor

August, 1958

SERVICING THE ELECTRIC RANGE

This article is the thirty-second of a series intended to assist readers who are required to service domestic electric ranges.

DCA. 543 De Luxe Upright Cabinet Model, 3-Hotplate (Fig. 1)

Rating: 240V. A.C. only, 8.4 kW., 35.0 amps.

Terminal Loadings: O.A. 15.8 amps. 2800W. oven elements, and $6\frac{1}{4}$ in. dia. 1000W. hotplate.

H.A. 19.2 amps. 2800 W. griller hotplate and 8 in. dia. 1800W. hotplate.

A.T.L. "Twinmatic" Timer. Minute Minder section can be set to control $6\frac{1}{4}$ " dia. hotplate. Lift out splash back and remove back panel for access to timer. Timer wired to range with flexible conductors. (Fig. 3)

1800W. 8" dia. radiant hotplate. (Plug-in Non-E.D.A.) Refer Fig. 2

2800W. tubular sheathed side and bottom oven elements. Each section of 1400W., covers one side and half bottom of oven (Fig. 4). Terminal connected to bus bars below oven (Fig. 3). Oven elements removed by detaching relative side panel (Fig. 3), oven side and bottom baffles (Fig. 4), and bracket securing element to oven liner, then disconnect from bus bars and lift out.

Door spring mechanism behind each side panel (Fig. 3).

Rating plate, and "Federal" 15 amp. wedge fuses. Behind clip-on lower front panel. (Fig. 4).



Plug-in splash back. Located by two round pins and two flat lugs and brackets at rear of range. Flexible connections from timer to range wiring.

1000W. $6\frac{1}{4}$ " dia. radiant hotplate. (Plug-in fitting) Non-E.D.A. type (Fig. 2).

2800W. 12" x 10" cast griller hotplate (Plug-in, Non-E.D.A.). Refer Fig. 2

Hinged hob. Lift out splash back before raising hob. (Fig. 2).

Griller compartment door spring mechanism behind each side panel (Fig. 3).

"Satchwell" type 'T.C.' bi-metal oven thermostat.

"G.W. 3-heat S.P. switches with screw on spindles.

"G.E.C." 'Simmer-Switch'. (For access to thermostat, switches, 'Simmer-Switch', wiring, etc., remove right side panel, Fig. 3.)

Main terminals. Behind right side panel (Fig. 3).

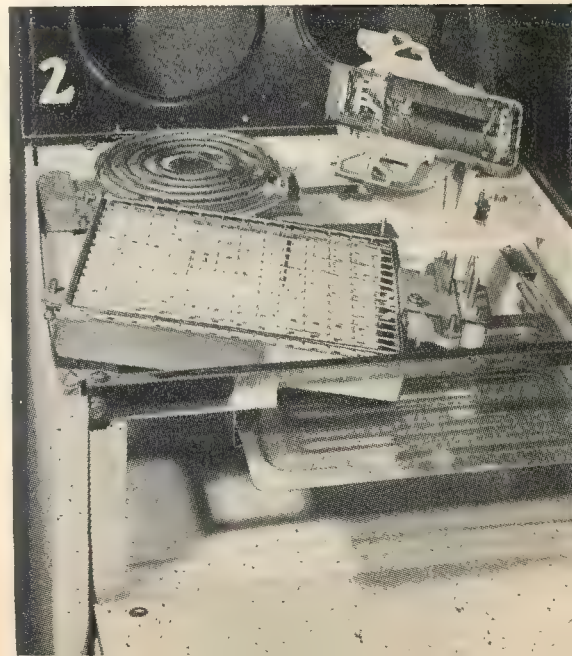
FIG. 1.

FIG. 2. Showing splash back removed, hob raised, grill compartment door opened and hotplates removed from plug-in (non E.D.A.) fittings. $6\frac{1}{4}$ " dia. hotplate controlled by "Simmer-Switch", other hotplates by 3-heat switches.

SOUTHERN TABLELANDS COUNTY DISTRICT ENLARGED

As from 1st September, 1958, the Southern Tablelands County Council assumed control of the electricity undertakings of the former Southern Tablelands and Burrinjuck County Councils, the Queanbeyan Municipal and Yarrowlumla Shire Councils.

The constituents of the enlarged area are—City of Goulburn, the Municipalities of Yass and Queanbeyan and the Shires of Crookwell, Goodradigbee, Gunning, Mulwaree, Tallaganda and Yarrowlumla.



SERVICING THE ELECTRIC RANGE

This article is the thirty-fourth of a series intended to assist readers who are required to service domestic electric ranges.

ITEM NO 68 "METTERS" MODEL 7 STREAMLINED SHEET METAL RANGE

Table Top Cabinet Model, 4-Hotplate (Fig. 1)

Rating

240V. A.C. only, 13.2kW., 55.0 Amps.

Terminal Loadings

A — 18.1 Amps. Right side power outlet, left 8 in. dia. 2100W. hotplate, front 6½ in. dia. 1250W. hotplate.

B — 19.8 Amps. Left side power outlet, 40W. oven lamp, "Roto-Grill" motor, rear 6½ in. dia. 1250W. hotplate, 2200W. main oven element, 300W. warming element in griller oven.

C — 17.1 Amps. 2000W. griller element, right 8 in. dia. 2100W. hotplate.

Hotplate and power outlet selector control. "G.W." Cat. 1286 switch with screw-on spindle.

"T.Y.C." 'Simmerstats' controlling hotplates, griller, and warming oven elements.

For access to switches, etc., remove top rear panel. (Fig.3)

Diamond "H" 10 Amp. toggle switch for Roto-Grill motor.

H.P.M. 10 Amp. combination power outlets, at each end of splash back.

Top grill element. 2000W. Tubular sheathed. (Fig.4)
To remove, unscrew 2 screws in plate securing element to back of oven, unfold clips at each side front, pull element forward and disconnect wiring.

Roto-Grill in oven. (Fig.4)
Access to motor by removing lower rear panel. (Fig. 3)

Bottom warming element. 300W tubular sheathed. (Fig.4)
To remove, unscrew one screw holding front bracket, and 2 screws in plate securing element to rear of oven, pull element forward and disconnect.

Auto-manual control. "G.W." Cat. 1285 switch with screw-on spindle.

"Midgley-Harmer" timer. Minute Minder can be set to switch "off" left and front hotplates and right hand power outlet. Used with adjacent selector switches.

"Robertshaw" single stage oven thermostat.

Diamond "H" 10 Amp. toggle switch for oven lamp.

Rating plate and "S.E." 15 Amp. wedge type fuses behind nameplate. (Fig.2).

"Chromalox" hob mounted hotplates. (Fig.2)

Drip trays behind doors. (Fig. 2)

40W. E.S. oven lamp. (Fig.4)

Main terminals. Under cover plate at rear of oven. (Fig.3)

Bottom oven element only. 2200W tubular sheathed. (Fig.4)
To remove, unscrew 2 screws in plate securing element to back of oven, pull element forward and disconnect wiring.

Main oven door suspension. (Fig.5)
Access by removing front bottom clip-on panel.

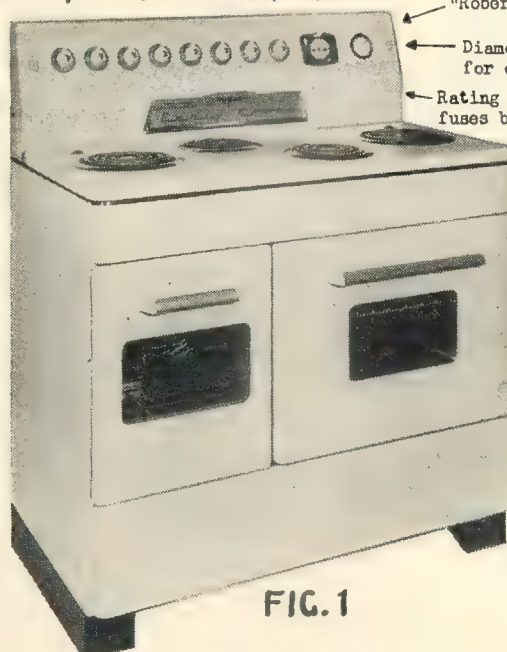


FIG. 1

Midgley-Harmer Oven Timer

Method of setting Midgley-Harmer timer is detailed in the January, 1957, issue of *The Contactor*.

(a) Oven Timer

On this range the Oven Timer section of the Midgley-Harmer timer is connected to control the



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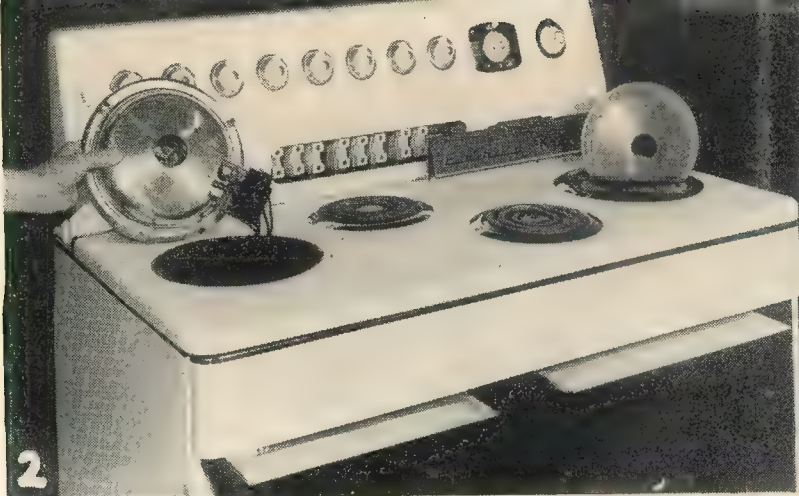


FIG. 2 — Showing clip-on nameplate removed from fuses, oven doors opened and drip trays pulled forward, hotplate reflector detached, and hotplate assembly removed from hob. Hotplate mounting ring secured to hob with folded lugs or push-in clips. T.Y.C. simmerstat control.

bottom oven element only in the main oven.

(b) *Minute Minder*

The Minute Minder section can be set to automatically switch off the left and front hotplates, and the right hand power outlet individually or in combination depending on position of the hotplate selector.

To set the Minute Minder for automatic control:

- (i) Push in **top white knob** on timer and turn clockwise to required time delay within four hours.
- (ii) Set **switch** marked H/P TIMER to AUTO position.
- (iii) Set switch marked H/P SELECTOR to any of the following combinations, as required:—

LEFT — Left hotplate only.

L-F. — Left and front hotplates.

F. — Front hotplate only.

P.P. — Right hand power outlet only.

- (iv) Set simmerstat controlling hotplate as nominated on H/P SELECTOR to required setting, or power outlet to "ON" position.

FIG. 4 — Shows griller, warming element, and "Rotisserie" in position in "Roto-Grill" oven, also bottom element withdrawn ready for disconnection of terminals in main oven. Also location of oven lamp.



FIG. 3 — Rear of range with top and lower panels removed for access to timer, switches, main terminals, wiring, etc.

- (v) When the operating period is complete, the Minute Minder bell will ring and the selected combination will be automatically switched off.
- (vi) To stop the bell ringing, turn top white knob anti-clockwise to its stop position, and while holding against the stop, gently pull knob outwards.
- (vii) Switch "OFF" simmerstat or power outlet.

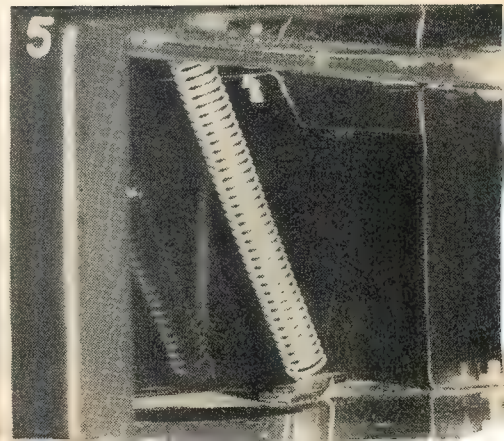
NOTE: When operating the "AUTO" control, the BACK AND RIGHT hotplates, plus left hand power outlet, can be used in the normal manner.

To use any of the units which can be controlled through the Minute Minder in the **normal manual manner**, turn H/P. AUTO switch to position marked MANUAL for **normal** operation.

Other Features

Glass inspection windows in both oven doors. Side opening door on "Roto-Grill" oven, and smokeless grill pan.

FIG. 5 — Lower front clip-on panel removed showing spring mechanism for drop type main oven door.





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TRICAL EQUIPMENT

page 141)
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SERVICING THE ELECTRIC RANGE

This article is the thirty-fifth of a series intended to assist readers who are required to service domestic electric ranges.

ITEM NO. 69

"ENGLISH ELECTRIC" STREAMLINED SHEET METAL RANGES

Upright Cabinet, 3-Hotplate Models, 2030 and 2031 (Fig. 1)

Rating

240V. A.C. only, 8.1kW, 34.0 Amps.

Terminal Loadings

H.A. 23.0 Amps. One 8 in. dia. 1800W. and one 6½ in. 1000 or 1150W. hotplates, and 2500W. griller hotplate.

O.A. 11.0 Amps. 2600W. oven elements, and 40W. oven light.

FIG. 1. Shows model 2031. Model 2030 is similar, but without oven and minute timers in splash back.

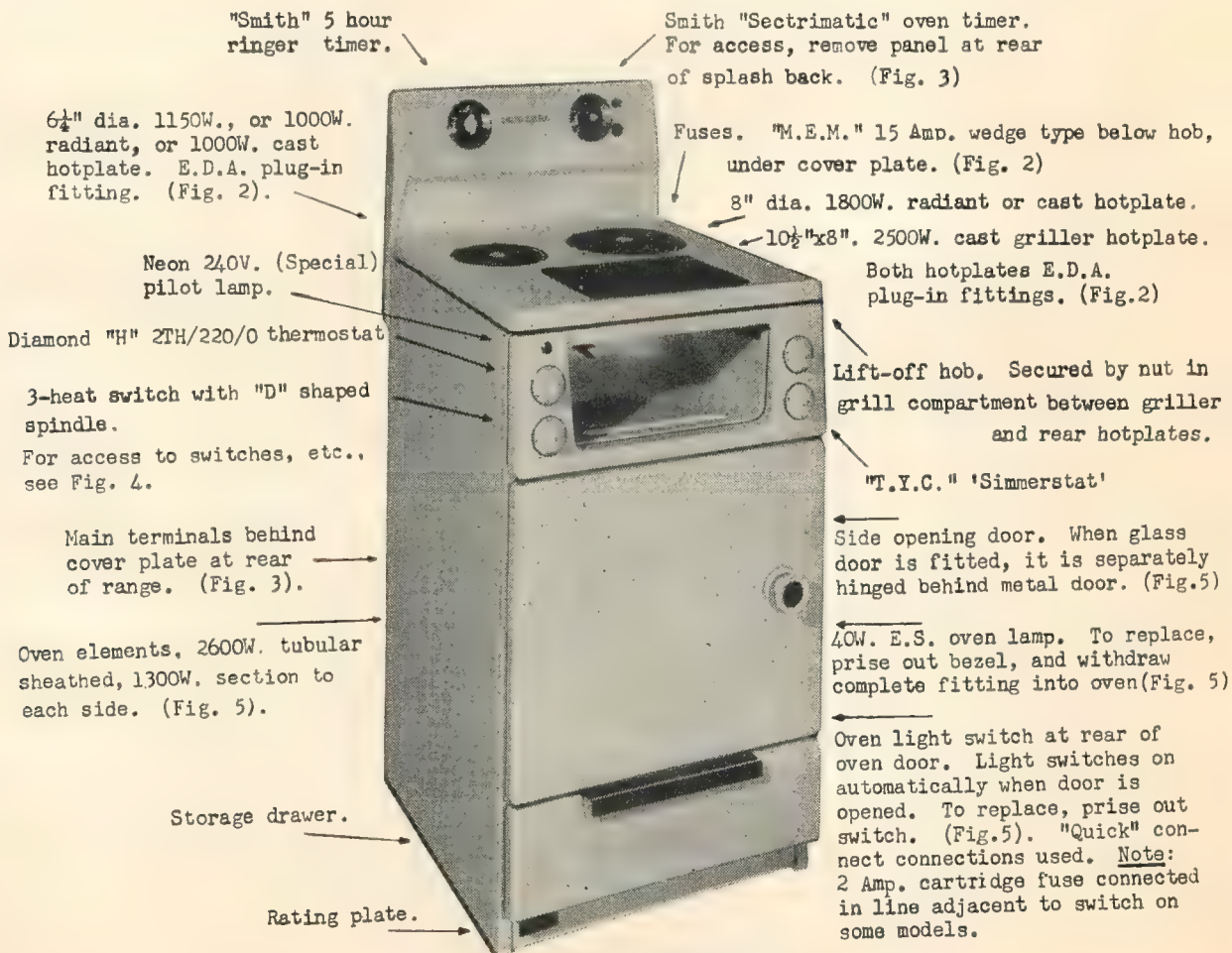
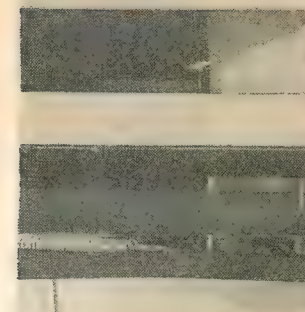


FIG.1-2031



for access to timer,
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A.T.L. "Twinmatic"
1958, issue of *The*
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Examination

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lower clip on panel
spring mechanism.



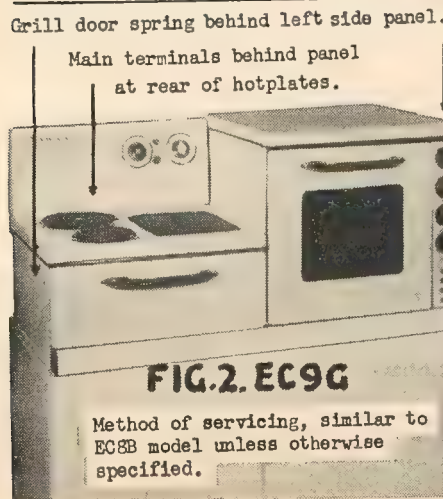
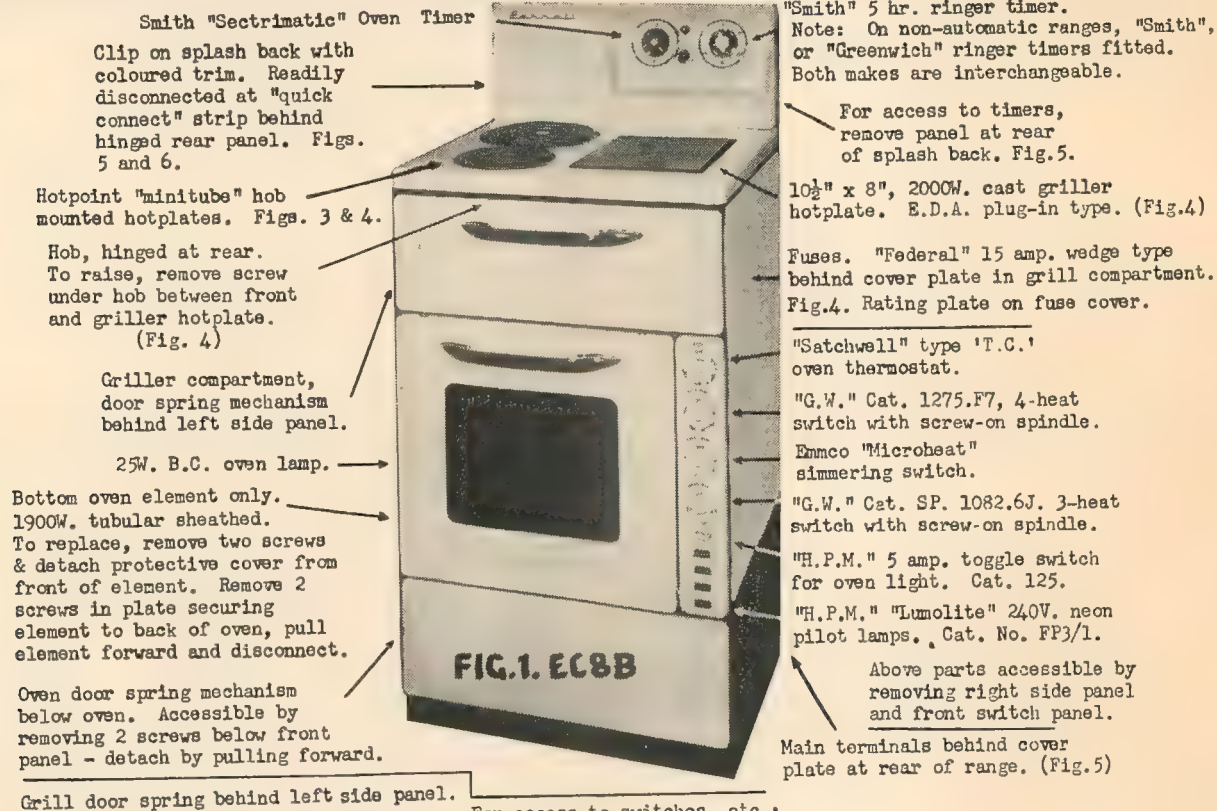
SERVICING THE ELECTRIC RANGE

ITEM No. 70. This article is the thirty-sixth of a series intended to assist readers who are required to service domestic electric ranges.

"PARNALL" STREAMLINED SHEET METAL RANGES

EC8B Upright Cabinet Model, 3-Hotplate

EC9G Elevated Oven Model, 3-Hotplate



For access to switches, etc.:

- Remove oven crown.
- Detach cover strip from bottom of oven.
- Pull off all switch knobs & detach switch panel.
- Remove screws securing side panel to front & rear of range & detach panel.

Note: When oven is located at left of hotplates:

- Remove crown and raise hob
- Remove screws at base & rear of panel at side of switches.
- Detach side & switch panels

Oven door springs. Below oven door. For access move range forward on cupboard.

Both models are available as fully automatic (with oven timer and ringer timer), or non-automatic (with ringer timer only).

Rating—240V., 7.2kW, 30 Amps.

Terminal Loadings—13.8 Amps. One 8" dia. 2050W., one 6½" dia. 1250W. hotplates.

16.2 Amps. 1900W. oven element and 2000W. griller hotplate.

ELECTRIC I

is intended to assist
estic electric ranges.

T METAL RANG

terminals — At rear, on bo
ing cover plate in lower ba
s — 8 in. dia. and 6½
secured to hob with folding
for disconnection after r
tach reflector pan, and fo
plate removed.

lements — Top and bo
plug-in type. Fig. 6. Botto
ing screws in front of ele
ments are controlled by au
mostat.

On the "Supermatic" mo
2-stage oven thermostats
non automatic timer. This
ed automatically or manu
r, i.e., one oven cannot
her manually.

, Thermostats, Timers, Ne
n splash back on both
te., remove top back pane
moved.

lights — To replace lamps,
flat side of table knife,
cover will then slide out
replace. Fig. 6.

nts — "Constellation" mo
ate. "Supermatic" model:

ports — Drop type, with
ring mechanism below fro
el: spring mechanism acc
remove two screws and
and unscrew two nuts one
l and remove same —
ring mechanism accessibl
ress-on clips below ovens.
Fig. 4.

ie" or "Barbecue" —
on "Supermatic" mode
set, or frame for holdi
motor located at rear of
from motor drive by li
ward.

Asbestos covered heat re
both rear panels from

Diagrams — "Constellat
" model Fig. 11.

ITEM 71

G.M.H. "FRIGIDAIRE" UPRIGHT CABINET SHEET METAL RANGES

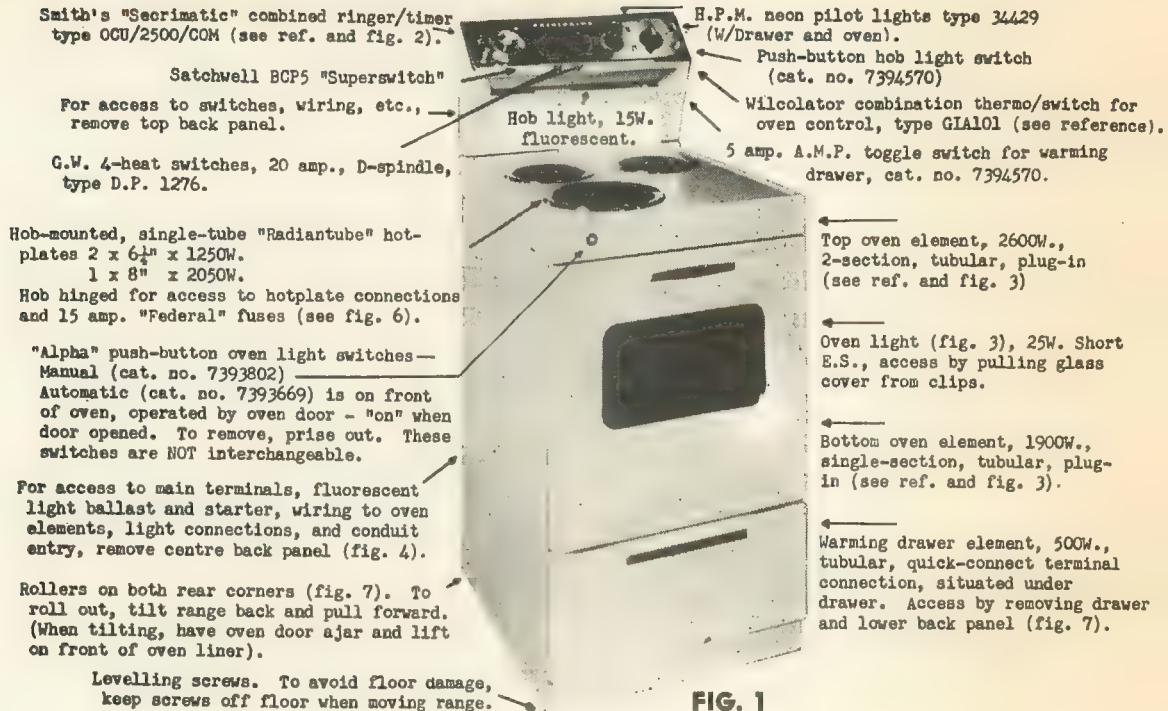


FIG. 1

RANGE OF MODELS

D26 (De Luxe 26") 4-hotplate, glass door, timer

Rating at 240V.: 10.0 kW, 41.7 amp.

Terminal Loadings:

- A1. Oven, power outlet: 3.61kW, 15.1 amp.
- A2. 3x1250W. radiant hotplates: 3.75kW, 15.6 amp.
- A3. 2050W. radiant hotplate, 550W. warming drawer, oven light, hob lights: 2.64kW, 11.0 amp.

D22 (De Luxe 22") 3-hotplate, glass door, timer

Rating at 240V.: 7.69kW, 32.03 amp.

Terminal Loadings:

- A1. Oven: 2.6 kW, 10.83 amp.
- A2. 2x1250W. radiant hotplates: 2.5 kW, 10.41 amp.
- A3. 2050W. radiant hotplate, 500W. warming drawer, oven light, hob lights: 2.59kW, 10.79 amp.

M22 (Master 22") 3-hotplate, glass door

Rating at 240V.: 7.65kW, 31.86 amp.

Terminal Loadings:

- A1. Oven: 2.6 kW, 10.83 amp.
- A2. 2x1250W. radiant hotplates: 2.5 kW, 10.41 amp.
- A3. 2050W. radiant hotplate, 500W. warming drawer: 2.55kW, 10.62 amp.

S22 (Super 22") 3-hotplate, metal door

Rating at 240V.: 7.15kW, 29.74 amp.

Terminal Loadings:

- A1. Oven: 2.6 kW, 10.83 amp.
- A2. 2x1250 W. radiant hotplates: 2.5 kW, 10.41 amp.
- A3. 2050W. radiant hotplate: 2.05kW, 8.5 amp.

ITEM NO.72 - THE SATCHWELL SUPERSWITCH.

One of the many improvements which have been incorporated in electric ranges in recent years is the variable hotplate control switch.

A recent addition to the range of these control switches is the Satchwell Superswitch, which is explained in this article.

These controls incorporate the now well established principle of obtaining variable heat input to hotplates by cyclic switching of the electricity supply, variations in input being obtained by varying the time "on" and time "off".

The making and breaking of the contacts is achieved through the flexing of a bimetal strip which, when the contacts are closed, is heated by a small element. The heat from the element causes the bimetal strip to flex and this movement is transmitted to the switch arm, eventually opening the switch contacts and interrupting supply to the hotplate and the control heating element.

As the bimetal strip cools it resets to its original position and closes the contacts.

Times "on" and "off" are varied by altering the tension on the bimetal strip.

The Satchwell Superswitch differs from previous devices of this type in that the heater is in the form of a strip and is connected in series with the hotplate element. It is claimed that with this arrangement, variations of performance, due to fluctuating ambient temperatures, are practically eliminated. For maximum efficiency of operation, it is necessary that a current within definite limits be passed through the series heater. Superswitches are, therefore, supplied in a number of wattage ratings and it is important that the correct switch should be used to suit the hotplate rating.

Satchwell Superswitches are made in two types:

- (a) Type BCP1 - A single stage control for use on a single section hotplate, or on a hotplate with two or more sections connected in parallel.
- (b) Type BCP5 - A 2-stage control for use with a 2-section hotplate so arranged that variable heat is obtained on the centre section alone or with the outer section switched on "full".

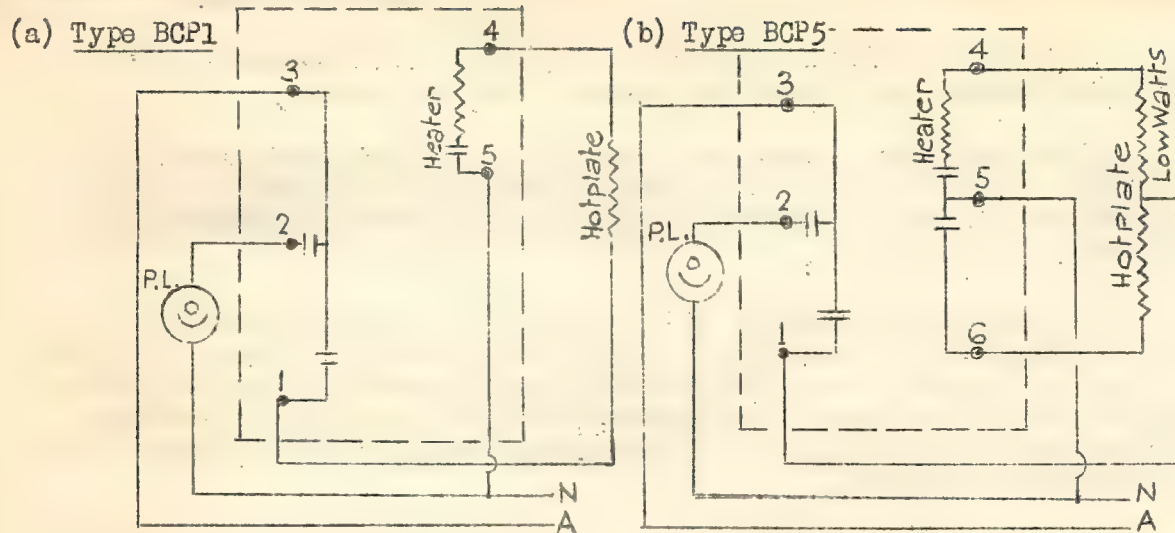
Over....

Ranges.

2.

ITEM NO.72 (CONT'D).

DETAILS OF THE TWO TYPES



(a) Type BCP1.

The knob is marked "Off", "Low", 1 to 9 and "High". The markings "off", "low" and "high" have definite stop positions. The knob can be rotated through 360° in either direction.

The BCP1 switch is supplied in ratings 800-900 W., 900-1,000 W., 1,000-1,100 W., etc., up to 2,200-2,400 W. The switch in "low" position is rated to give approximately 8 per cent. of the hotplate's output and approximately 50 per cent. when set on "7".

Operation of Switch.

All contacts are open in the "off" position. When switch is turned from "off" the contacts close and cycling commences (4-5). When the knob is turned to "high", heater contacts cease to cycle, and remain closed.

(b) Type BCP5.

The knob markings are in two sections each of 180° radius. The "inner" side is marked "low, 2, 3, 4 and high" ("low" on the "inner" side gives approximately 8 per cent. watts, No.4 gives approximately 33-1/3 per cent watts). The "both" side is marked in a similar manner (any switch position on the "both" side, switches the outer section on full, and gives variable heat on the inner section, e.g., approximately 8 per cent. watts on "low" and approximately 33-1/3 per cent. on No.4). All "high", "low" and "off" marked knob positions are positive. The knob can be rotated 360° in either direction. The switch is "off" between the two "high" positions.

The BCP5 switch is supplied in a number of ratings to suit the lower wattage section of the hotplate, viz., 800-900 W., etc., to 1,100-1,200 W. The BCP5 Superswitch can be used to control hotplates with a maximum total rating of up to 2,500 W.

ITEM NO.72 (CONT'D).Operation of Switch.

"Off" - All contacts open.

"Inner" Settings - Contacts between terminals 1 - 3, 2 - 3, 4 - 5 are closed. The heater contacts (4 - 5) will cycle, except when switch is turned to "high" - but then remain closed.

"Both" Settings - Operation is as for "inner" plus the closing of contacts between 5 and 7.

Pilot Lamps.

Both BCP1 and BCP5 Superswitches have contacts (terminal No.2) for a pilot light. They can be connected to individual pilot lamps for each hotplate or a pilot lamp common to a number of hotplates connected to the same phase.

Connections.

Superswitches are supplied with both screw and quick-connect lugs.

Field Service.

As it is not possible to dress the contacts and an external calibration adjustment is not provided, a faulty switch should be replaced.

SERVICING THE ELECTRIC RANGE

This article is the thirty-seventh of a series intended to assist readers who are required to service domestic electric ranges.

ITEM NO. 73. "DAVELL" STREAMLINED SHEET METAL RANGE

58 "Duomatic" Upright Cabinet Model, 3-hotplate, Fig. 1



FIG. 1

Rating at 240V.

A.C. only, 7.55kW, 31.4 amps.

Terminal Loadings

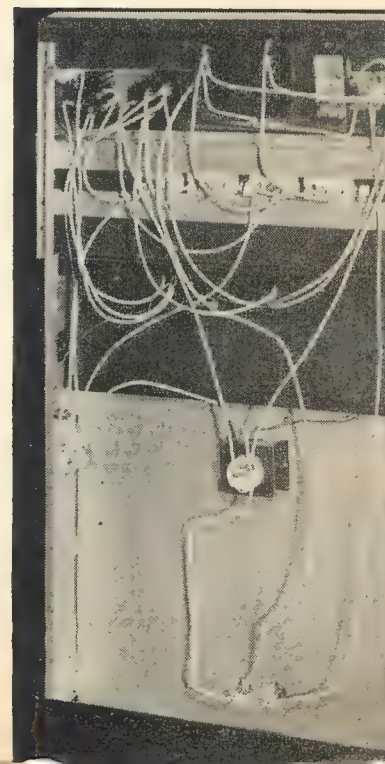
A1. Left front 8 in. 2100W. hotplate, right 10 in. x 8 in. 2000W. grill-hotplate.

A2. Left rear 6½ in. 1250W. hotplate, 2200W. bottom oven element, 40W. E.S. oven light, oven timer.

FIG. 2. Rear of range with back panel removed for access to timer, switches, main terminals, wiring, oven light holder, etc. Conduit enters at back through hole in plinth.

Removal of back panel: Remove two screws situated at the top corners of the back panel, tilt back slightly, then lift off bottom retaining bar.

Removal of side panels: Remove two screws at rear of panel (see Fig. 2), pull back of panel outward then slide forward.



ELECTRIC

of a series intended to
service domestic electric ra

ED SHEET METAL R

Main Terminals — At rear
by removing cover plate in l

Hotplates — 8 in. dia. a
mounted. Secured to hob wit
accessible for disconnection
section, detach reflector pan,
shows hotplate rer

Oven Elements — Top
elements. Plug-in type. Fig.
have locating screws in front
oven elements are controlled
stage thermostat.

NOTE: On the "Supermatic"
individual 2-stage oven ther
by a common automatic time
can be used automatically o
or together, i.e., one oven c
and the other manually.

Switches, Thermostats, Tim
Located on splash back o
switches, etc., remove top ba
panels removed.

Oven Lights — To replace
oven with flat side of table
and glass cover will then s
lamp and replace. Fig. 6.

Oven Vents — "Constellat
front hotplate. "Supermatic"
Fig. 7.

Oven Doors — type
models. Spring mechanism b
ation" model: spring mechan
backwards, remove two scr
of plinth, and unscrew two
front panel and remove sa
model: spring mechanism
held by press-on clips below
drawers — Fig. 4.

"Rotisserie" or "Barbecu
side oven on "Supermatic"
"Rotisserie" set, or frame f
a geared motor located at
be detached from motor dri
pulling forward.

Wiring — Asbestos covered
by removing both rear pane

Wiring Diagrams — "C
"Supermatic" model Fig. 11.

SECTION 2.
ITEM No.74.

U.M.I. SHEET METAL RANGES

"Enfield" Upright Cabinet Model, 3-hotplate—Fig. 1

Rating at 240V

8.8kW, 36.6 amp. or 9.2kW, 38.4 amp., depending on rating of griller-hotplate fitted (see Fig. 1).

Terminal Loadings

A1. Oven and 1,250W radiant hotplate—4.75kW, 19.8 amp.

A2. Griller-hotplate and 2,050W radiant hotplate—4.05kW, 16.8 amp., or 4.45kW, 18.6 amp.

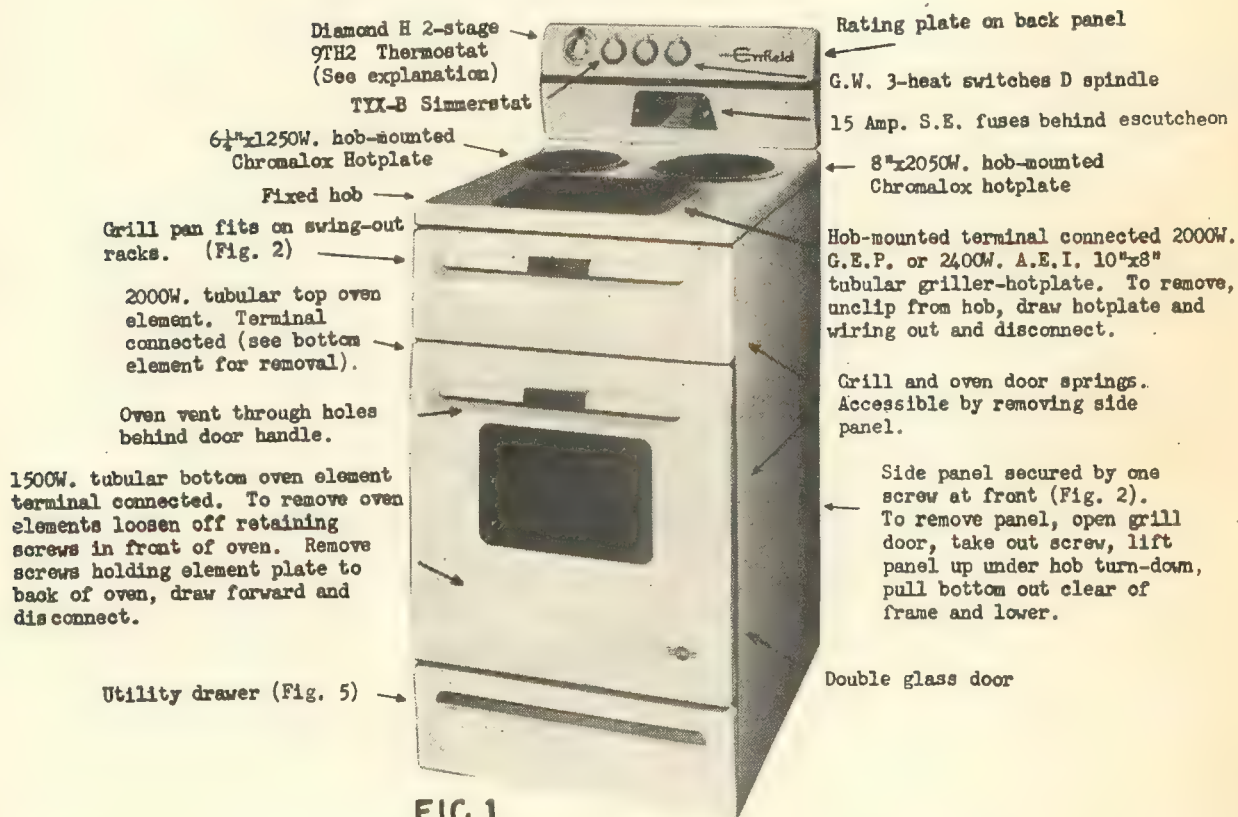


FIG.1

Diamond H. 2-stage 9TH2 Oven Thermostat

1. Bake

Turn thermostat knob to indicate temperature required (both top and bottom elements will switch on). Top oven element will be automatically switched off before full temperature is reached. The

bottom oven element will continue to heat until required temperature is reached. The oven will cycle on the bottom oven element unless the temperature drops approx. 70°F. (may happen if door is left open for several minutes) when top oven element will automatically be switched on.

ITEM No.74 (CONTINUED).

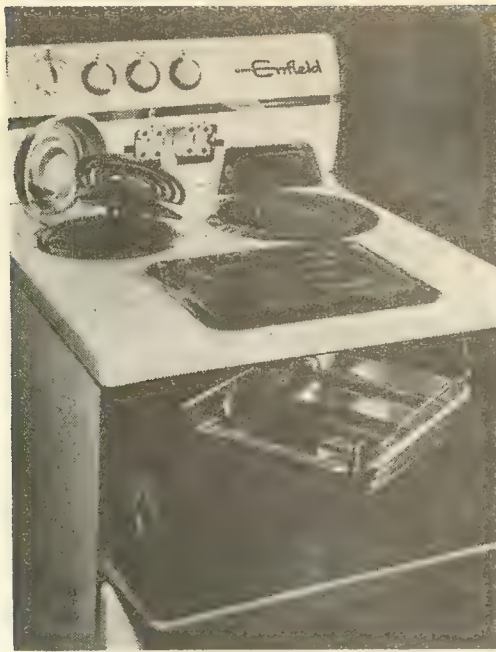


Fig. 2 shows 1,250W radiant hotplate raised and reflector removed. Escutcheon plate also removed giving access to 15 amp. S.E. fuses. Grill door open and grill pan on swing out rack to allow turning of meat without removing pan. Rack is pivoted on right-hand side and may be lifted clear of hinge for cleaning. Also visible is screw holding side panel.

Fig. 4. Range with the two sections of back panel removed showing main terminal block mounted inside switch fascia panel, oven element terminals, fuses, conduit entry, controls, and wiring.

2. Grill

Turn knob to grill position. The thermostat incorporates a switch which isolates the bottom oven element and switches on the top oven element.

3. Adjustment of thermostat setting

The calibrating screw is located at the back of the thermostat. It is recessed and covered by a rubber plug which can be removed readily. To adjust oven temperature: turn calibrating screw clockwise to lower temperature, and anti-clockwise to raise temperature; 90° turn of calibrating screw raises or lowers temperature 40°F.



Fig. 3. Oven with bottom oven element drawn forward and disconnected. Woven glass door gasket sets into recess around oven liner — ends pass through holes in oven surround.

Fig. 5. Side panel removed showing position of grill and oven door springs. Utility drawer drawn forward showing attachment of runners.



SECTION 2.

ITEM No.75.

PARNALL E16 UPRIGHT CABINET SHEET METAL RANGES

Rated at 240V

7.65kW, 31.8 amp.

Terminal Loading

A1. 1250W hotplate

2400W 2 section grill hotplate, 15.4 amp.

A2. 2100W hotplate — 1900W oven, 16.4 amp.

Rating plate situated at rear section of grill compartment.

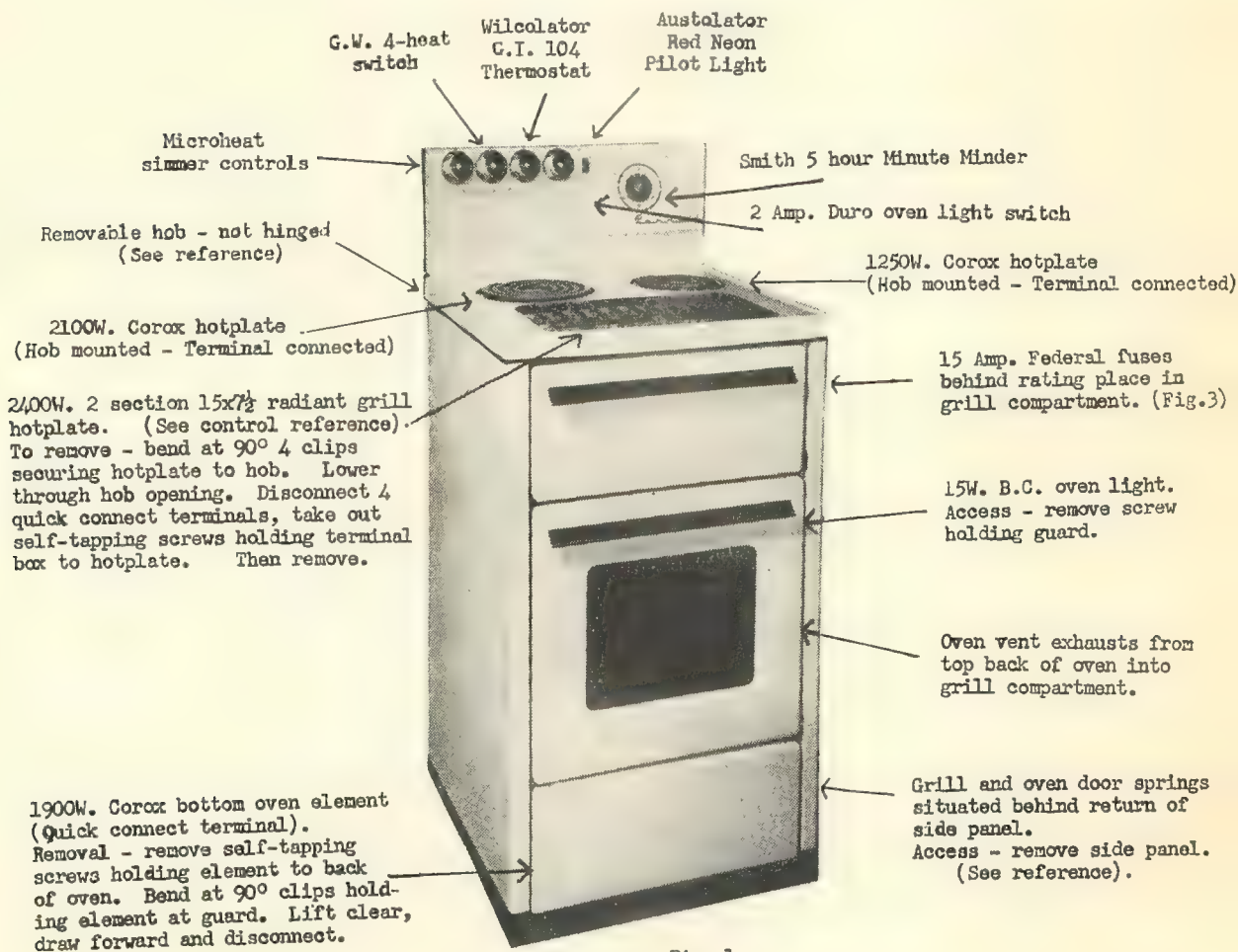


Fig. 1

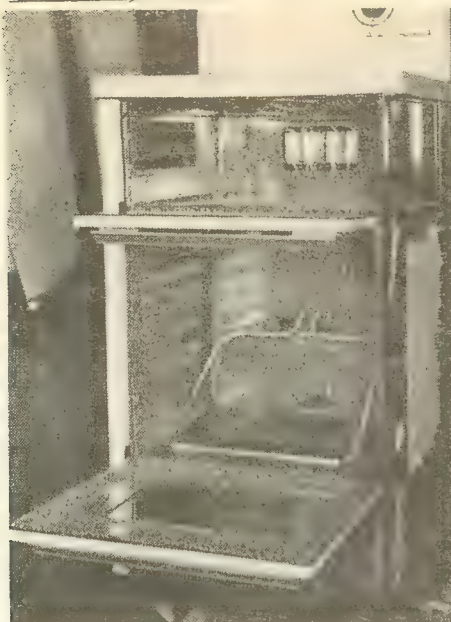


FIG. 2. Shows side panel removed, both grill and oven doors open revealing the relative positions of the fuses (rating plate on fuse chamber cover), door springs and tension spring securing door gasket. Oven element is disconnected for removal as per fig. 1.



FIG. 3. Shows grill dish and slide in position. Grill hotplate removed per instruction in fig. 1. Hotplate coil raised to allow removal of reflector.



FIG. 4. The back panels removed to give access to wiring, switches, oven terminal block, also main terminal block.

MODELS AVAILABLE

All models rated at 240V, 7.65kW, 31.8 amp. available, white or cream. Control knobs in blue, green, iridescent red, turquoise or pink.

Regent

As illustrated in Fig. 1.

Regent De Luxe

Same as Regent with these additions:—

- (a) Smith Secrimatic Combination Timer/Ringer replaces 5-hour Minute Minder.
- (b) Two Micro Heat Switches replace G.W. 4-heat switch giving individual control on each section of grill-hotplate.
- (c) Telltale lights to individual switches.
- (d) Cast aluminium Dry Fry Griddle plate.

Royal

Same as Regent but without 5-hour Minute Minder and oven light. Controls evenly spaced across splash back.

GRILL HOTPLATE CONTROL

(Regent and Royal)

Four-heat G.W. switch controls 2-section grill hotplate as follows—

- High Both sections in parallel
- Right Right section only
- Left Left section only
- Low Both sections in series.

The two sections can be used as individual hotplates giving the equivalent of a total of 4 hotplates.

REMOVAL OF HOB

- (a) Take out self-tapping screws securing back panel to splash back.
- (b) Remove $\frac{1}{4}$ bolts securing hob in grill compartment.
- (c) Raise hob as required.
- (d) Hob can be removed completely by disconnecting quick connect terminals from terminal at rear of splash back.

REMOVAL OF SIDE PANEL

- (a) Remove hob clear of side panel as in previous reference.
- (b) Take out self-tapping securing back panel.
- (c) Pull out side panel at rear and slide forward.

OVEN DOOR GASKET

Secured behind lower front by a hook on the left side and in a hook under spring tension on the right side. Gasket fits into recess around front of oven. Access to tension spring—tilt range back, remove two self-tapping screws holding lower section of front panel—lift off panel.

GRILL DISH

Grill dish is supported in a removable wire frame. It is intended that the frame and dish shall be removed and placed on an adjacent table or other surface for loading, turning or serving food.

SECTION 2.

ITEM No. 76.

D.C.A. 583 "Space Chief" Upright Cabinet Model, 3-hotplate

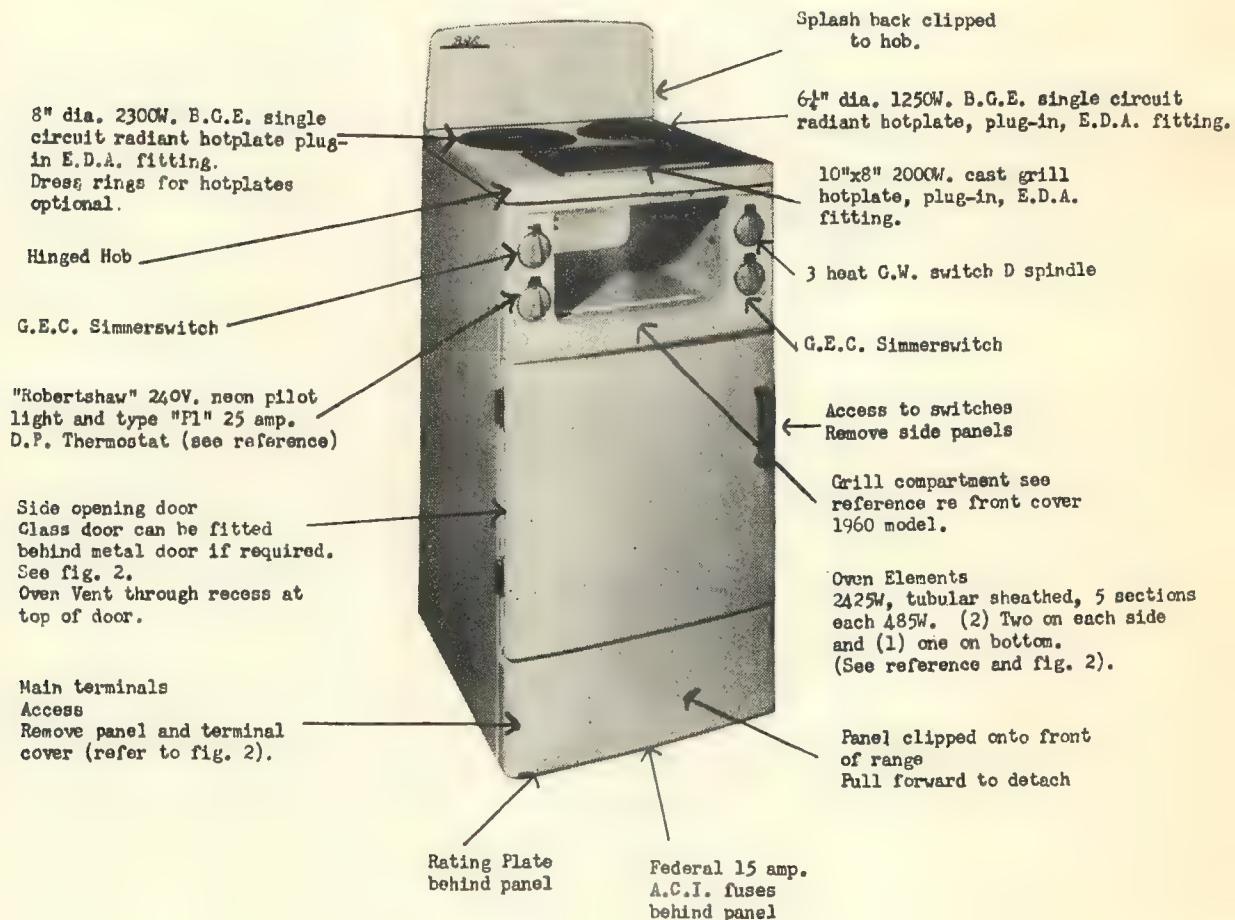
B.G.E. STREAMLINED SHEET METAL RANGES

Rated at 240 Volt, 7.975kW, 33.2 amp.

Terminal Loading

O.A.—Oven—6½" dia. hotplate, 3.675kW,
15.3 amp.

H.A.—8" dia. hotplate—10" x 8" grill-hotplate,
4.3kW, 17.9 amp.



ITEM No.76.(CONTINUED)

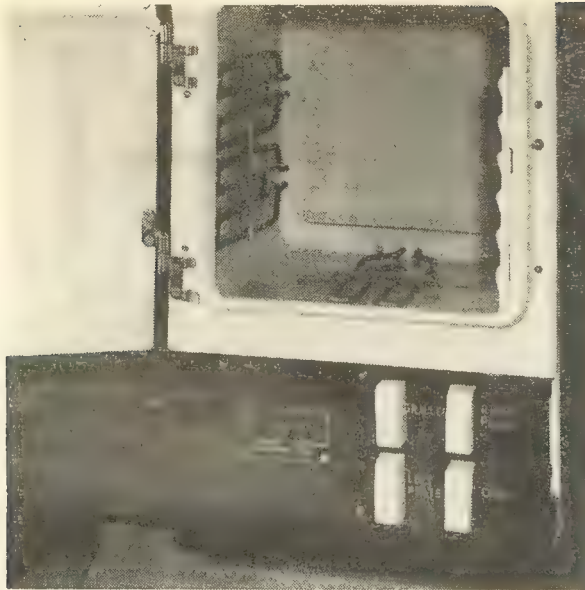


Fig. 2. Shows oven baffles removed, elements in position also method of securing, extended hinge allowing for fitting of interior glass door; lower front panel removed revealing position of fuses, rating plate and terminal cover.

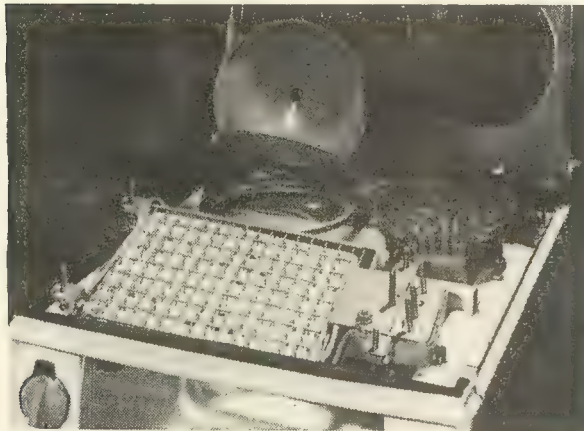


Fig. 4. Hob raised, grill-hotplate removed and inverted, reflector removed from 2,300W. radiant hotplate, 1,250W. radiant hotplate in position.

1. ALTERNATIVE HOTPLATES

First models rated at 240 Volt, 7.225kW, 30.05 amp, had cast or radiant hotplates rated at 1800W. and 1000W. respectively.

2. OTHER MODELS

D.C.A. "582" Upright Cabinet Model—

2-hotplate, rated at 240 Volt, 6.725kW.
28 amp.



Fig. 3. Side and back panel removed showing hotplate and oven controls, hotplate and oven terminals, main terminals.

Similar in design to D.C.A. "583" model minus 6 $\frac{1}{4}$ " dia. hotplate.

Oven Element

2000W single sheathed radiant bottom oven element, screw terminal connected.

To replace—

- (a) Take out screws holding element and guard at front, and screws securing plate to back of oven.
- (b) Draw forward into oven and disconnect.

NOTE. 583 "Space Chief" ranges may also now be fitted with a 2000W. bottom oven element in place of five (5) 485W. side and bottom sections as shown in illustration.

D.C.A. 583 1960 "Space Chief"

Same as range illustrated in Fig. 1 with the ad-

SECTION 2.

ITEM No.77.

Westinghouse C.329 — 3 Hotplate Upright Model Ranges

Rating

240V. A.C., 9.95kW, 41.4 amp.

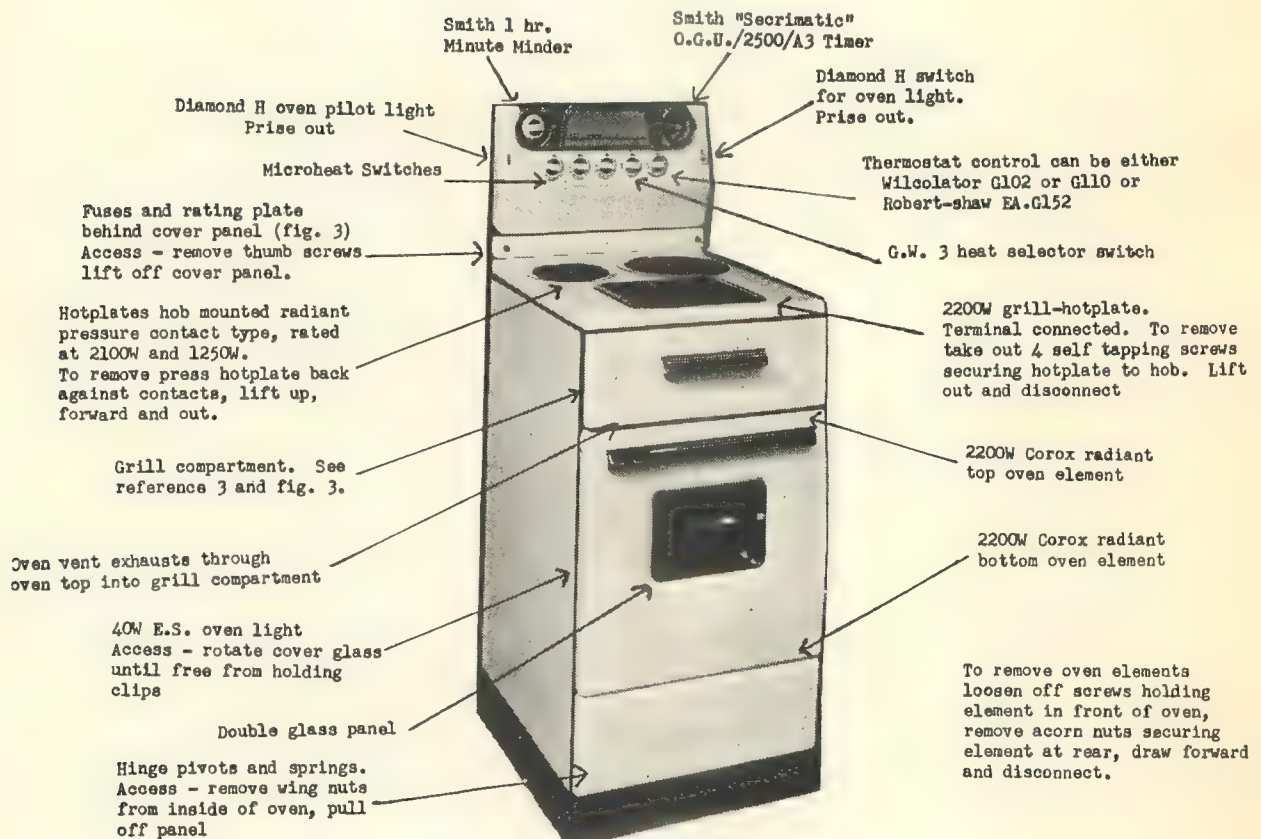
Terminal Loadings

A.1 2200W Top oven element.

2200W Bottom oven element, 4.4kW, 18.3
amp.

A.2 1250W Corox hotplate.

2200W Corox grill hotplate, 5.55kW, 23.1
amp.



ITEM No.77. (CONTINUED).



Fig. 2. Model C.359.



Fig. 3. Model C.329 with fuse cover removed showing position of fuses and rating plate. 2100W Corox radiant hotplate withdrawn from hob opening giving access to hotplate terminal block and fixed contacts. Corox radiant grill hotplate removed as per instructions on Fig. 1, terminal box now ready for disconnection. Grill compartment door partially opened showing operation of slide pivots (reference 3).

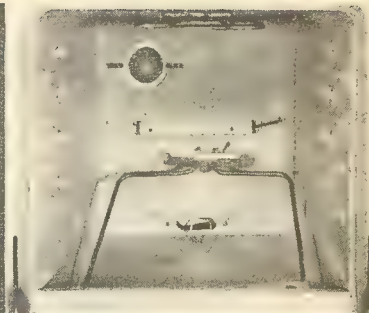


Fig. 4. Oven interior shows top oven element in position, bottom oven element disconnected. Also shown are locations of thermostat bulb, oven light and door gasket.

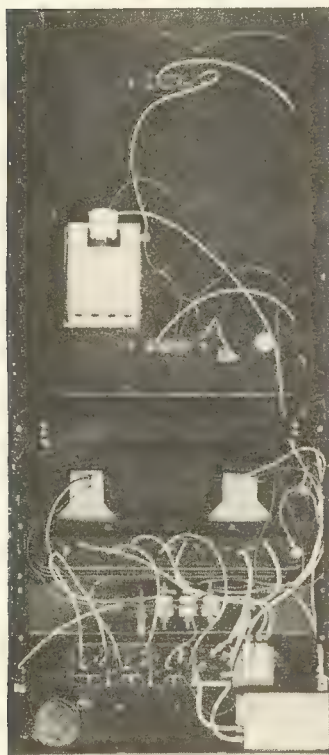


Fig. 5. Two section back panel removed to give access to switches, wiring and main terminals. Bracket used for securing flexible conduit can be seen to the right of main terminals.

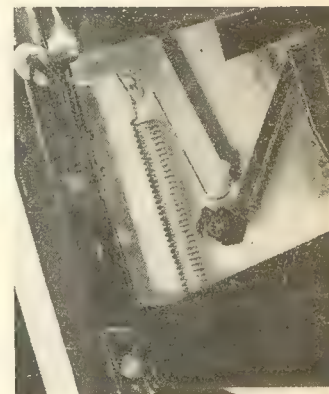


Fig. 6. Shows lower oven panel removed as referred to in Fig. 1 giving access to door hinge assembly and springs. When grilling in oven, door is held ajar by quadrant catching on roller.

1. Other Models.

C.328—3 hotplate, upright model. Same as model C.329 minus automatic timer.

C.359—3 hotplate, elevated model (Fig. 2). Electrical features of this model are the same as model C.329 only the position of the oven is altered. Oven exhausts through back panel. Utility drawer beneath grill compartment.

C.358—3 hotplate, elevated model. Same as model C.359 minus automatic timer.

2. Superseded Models.

Model C.329 will replace Model C.327 (fully automatic).

Model C.328 will replace Model C.326.

Model C.359 will replace Model C.357 (fully automatic).

Model C.358 will replace Model C.355.

3. Grill Compartment.

One of the features of this range is the semi automatic movement of the grill pan. Grill pan rests on slides which are pulled forward when grill compartment door is opened. See Fig. 3.

SECTION 2.

ITEM 78.

Westinghouse Model C.333/1 3 Hotplate, Upright Model Ranges

Rating:

240V. A.C., 7.75kW, 32.2 amp.

Terminal Loadings:

A.1 2100W Corox hotplate
2200W Bottom oven element, 4.3kW,
17.9 amp.

A.2 1250W Corox hotplate
2200W Grill hotplate, 3.45kW, 14.3 amp.

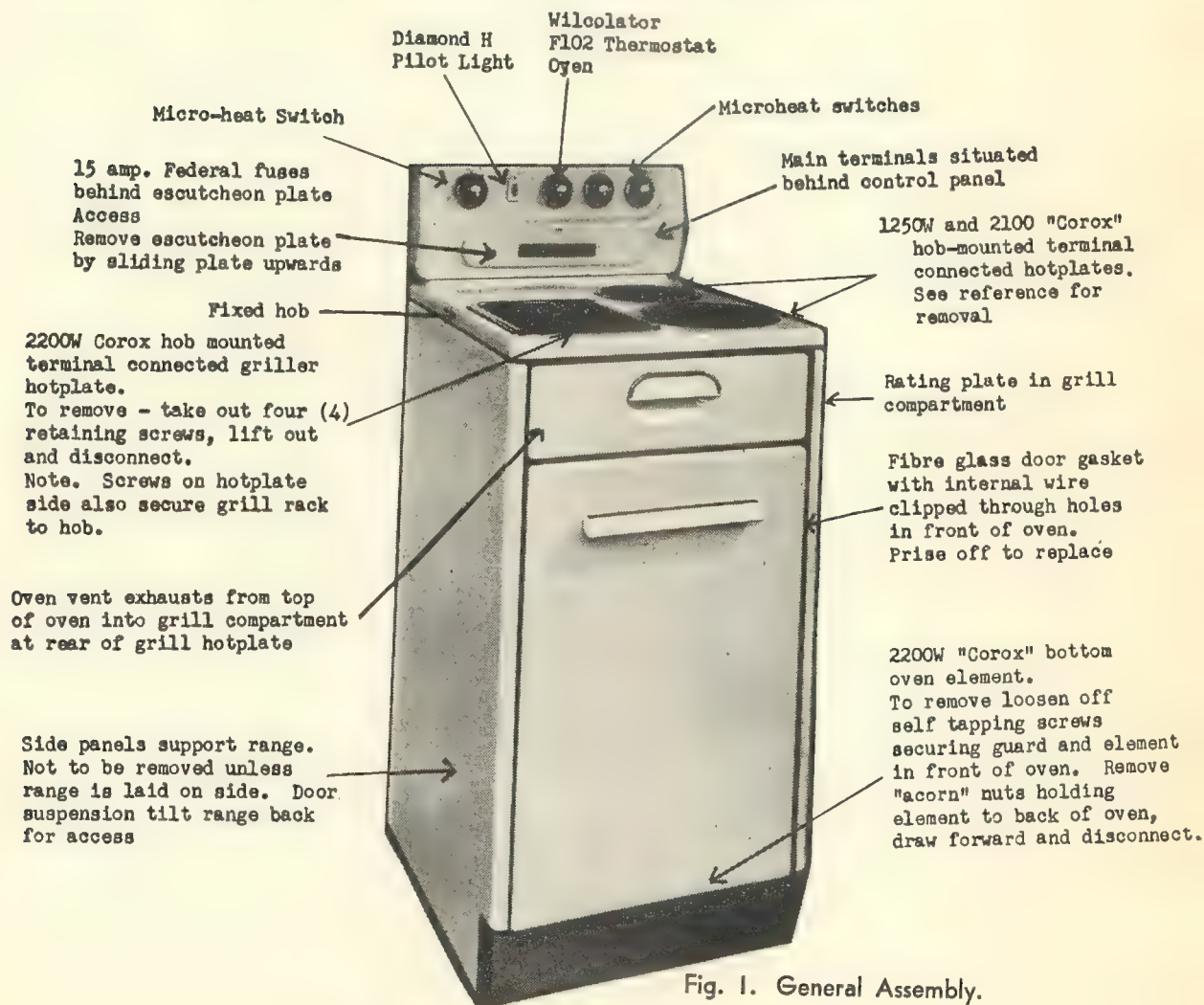


Fig. 1. General Assembly.

ITEM 78 (CONTINUED).

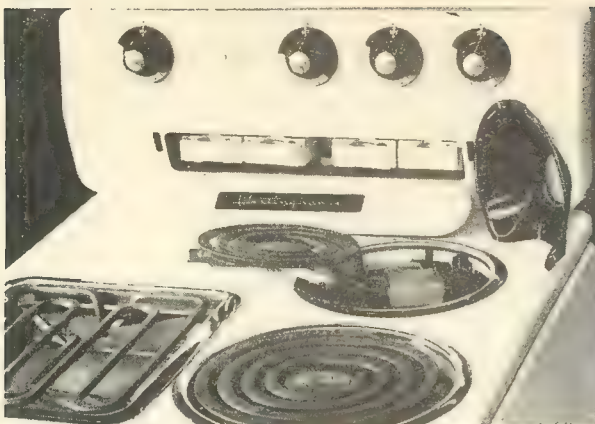


Fig. 2. Range hob and splashback with escutcheon plate removed showing fuses. Hotplate withdrawn from hob opening ready for disconnection.

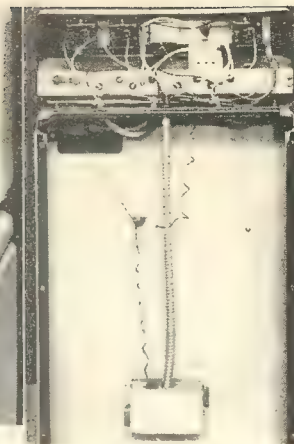


Fig. 3. Rear of range with back plate removed giving access to wiring, switches, main terminal block. Supply conduit entry through lower edge of control panel and hob adjacent to main terminal block.

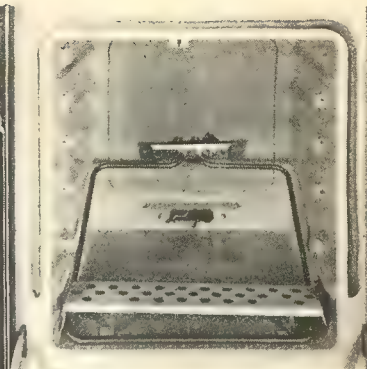


Fig. 4. Interior of oven showing bottom oven element disconnected, position of thermostat bulb and door gasket.



Fig. 5. View from bottom of range. Range tilted showing connection of springs and their relative positions on the door quadrant and pivot plate.

Other Model:

C.233/1 upright model, rated at 240V, 6.5kW, 27 amps. Same as model C.333/1 illustrated, minus 1250W Corox hotplate.

Additional Accessories:

10 x 8 cast aluminium griddle plate used either as a reflector when grilling or for surface cooking by fitting over grill hotplate.

Hotplates:

(a) Removal

- i. Press hotplate back against tension of retaining spring until hotplate support is clear of locating hole in hob.
- ii. Lift front of hotplate and draw forward releasing tension of spring.
- iii. Disengage spring from slot in hob opening.
- iv. Withdraw hotplate and disconnect.

(b) Replacement

- i. Make sure loop of spring is open and facing downwards.
- ii. Lay spring under guide bar.
- iii. Slowly push guide bar and spring, through slot until open loop of spring is on bottom of slot in hob.
- iv. Fix and close loop of spring on bottom of slot in hob.

SECTION 2.

ITEM N°79.

ST. GEORGE SHEET METAL RANGES

"Rotomaster" Upright Cabinet Model, 4 hotplate

Rating

240V A.C., 9.99kW, 41.6 amps.

Terminal Loadings

- A.1 3-1250W hotplates — 2050W hotplate — 5.8kW, 24.16 amps.
 A.2 2500W top oven element — 1600W bottom oven element — 60W oven light — 30W rotisserie motor — 4.19kW, 17.45 amps.

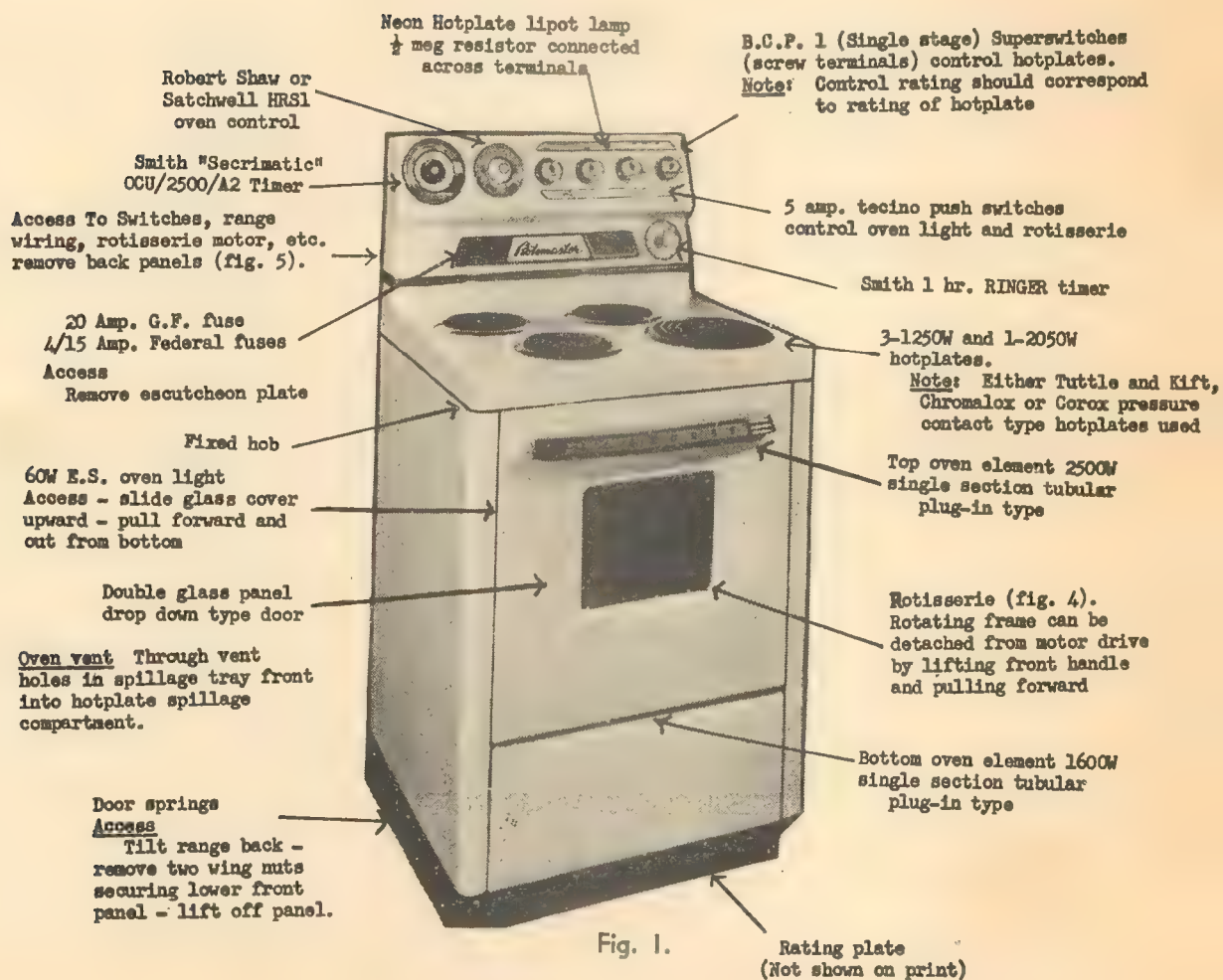


Fig. 1.

ITEM No. 79. (CONTINUED)

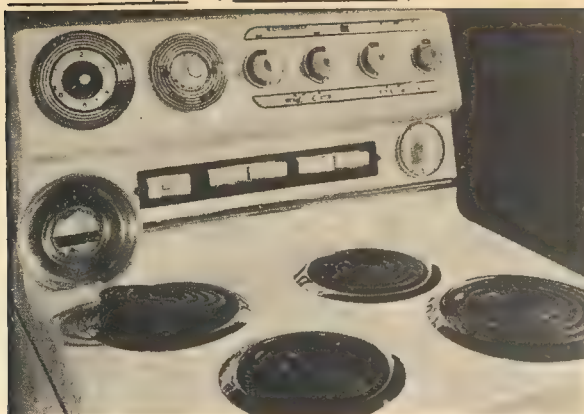


Fig. 3 shows 1250W Chromalox radiant hotplate raised and reflector removed. Escutcheon plate removed giving access to fuses.

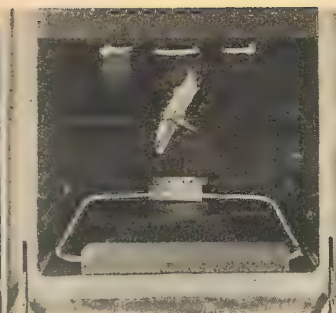


Fig. 4. Oven with bottom oven element withdrawn from terminal block, top oven element, rotisserie and oven light. Removable hotplate spillage tray above oven behind oven door.

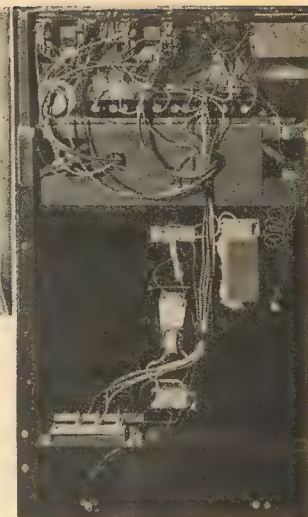


Fig. 5. Range with the 2 section back panel removed showing controls, wiring, oven terminal blocks, rotisserie motor, oven lamp holder, main terminals. Conduit entry situated to right of main terminals.



Fig. 2.

Other Model (fig. 2)

"Convair" Upright Cabinet Model, 3 hotplate

Rating

240V A.C., 8.9kW, 37.1 amps.

Terminal Loadings

- A.1 2-1250W hotplates — 2050W hotplate — 4.6kW, 19.1 amps.
- A.2 Top oven element 2500W — Bottom oven element 1800W — 4.3 kW, 18 amps.

Feature	Control
Left hand 1250W hotplate	3 heat switch
Right hand 1250W hotplate	Simmerstat
Front 2050W hotplate	3 heat switch
1800W tubular bottom oven element	3 heat selector switch and Australian Wilcolator thermostat
2500W tubular top oven element	

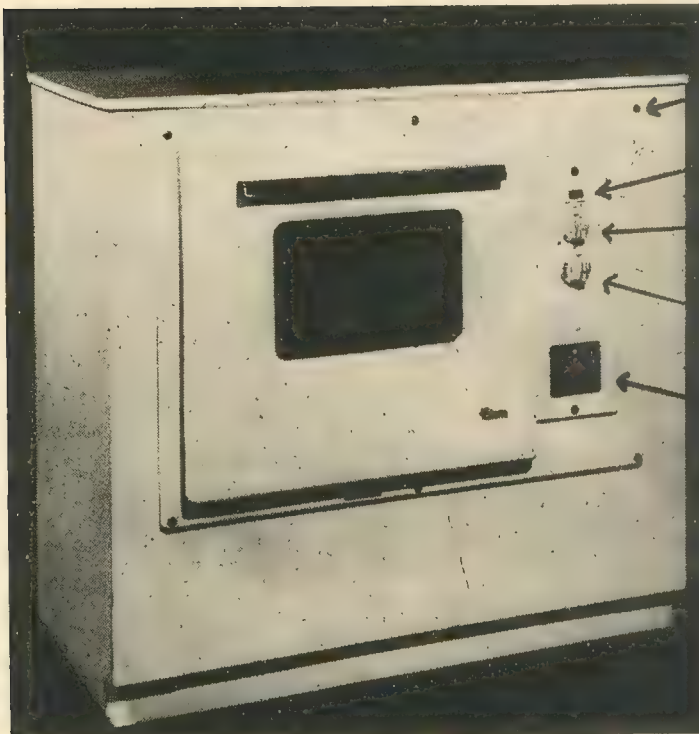
This model is not fitted with automatic timer, ringer timer, oven light, rotisserie or neon pilot light on hotplate controls.

SECTION 2.
ITEM No.80.

U.M.I. "ETON" RANGE
Built in Oven Unit

Rating

240V A.C., 3.5kW, 14.6 amps.



(6) mounting screws

Diamond H neon pilot light
prize out for service

Diamond H 2TH 117 oven
thermostat

"G.W." selector switch
(D spindle)

15 amp. "Federal" fuses
Access - remove cover plate (Fig. 2)

Access - to switches, main
terminals and wiring, remove
switch panel

Oven vent exhausts through
door under handle fixings

Fig. 1

1. Mounting

Oven can be mounted either in cabinet as illustrated or in raised position to height required.

2. Door Gasket (Fig. 2)

Fitted under edge of oven interior with ends fitted into slots. To replace — loosen off four

screws securing front of oven interior, ease interior forward to clear gasket.

3. Door Springs

Access—remove mounting screws, slide unit forward, remove insulation pad and cover from door springs (Fig. 4).

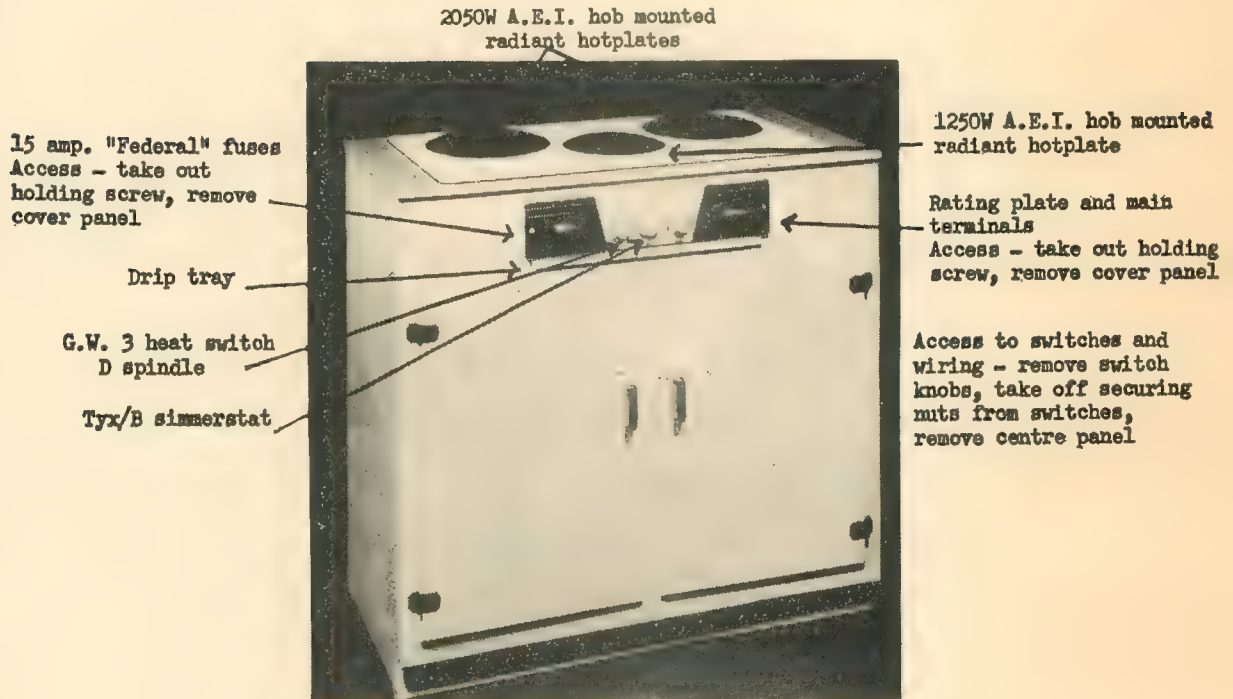
U.M.I. "ETON" RANGE**Built in Three Hotplate Unit***Rating*

240V A.C., 5.35kW, 22.29 amps.

Terminal Loadings

H.A. 1 2050W — 1250W radiant hotplates —
3.3kW, 13.75 amps.

H.A. 2 2050W radiant hotplate—2.05kW, 8.34
amps.

**Fig. 2****Built in Two Hotplate Unit***Rating*

240V A.C., 3.3kW, 13.75 amps.

Similar in construction to the three hotplate unit
with the following modifications—

1. Only one 2050W radiant hotplate.
2. 1250W radiant hotplate controlled either by 3
heat switch or simmerstat.

ITEM No.80(CONTINUED).

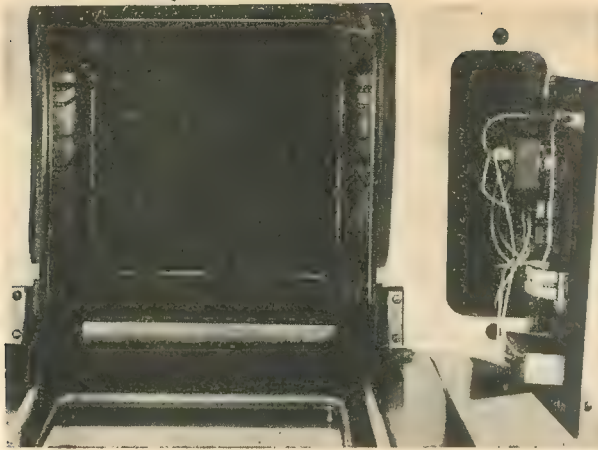


Fig. 3

Switch panel removed giving access to wiring, main terminals, switches, etc. Oven door open showing 2,000W. tubular top oven element, 1,500W. tubular bottom oven element, oven slide racks and door gasket. Oven thermostat bulb along right hand side of oven.



Fig. 4

Oven unit drawn forward giving access to door spring cover.

Note: Steel bands replace wire mesh on current models.

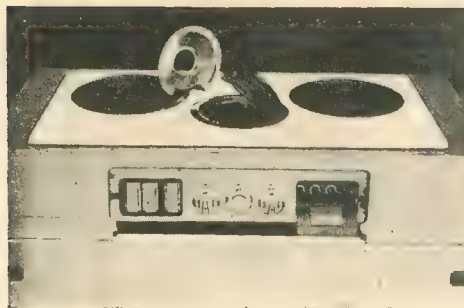


Fig. 5

Cover panels removed showing fuses, rating plate and main terminals. Drip tray drawn forward, small hotplate raised and reflector removed.

SECTION 2.
ITEM No.81.

A.E.I. "HOTPOINT" ELECTRIC RANGES
RF3GA "DE LUXE", Upright, 3 hotplate model

Rating

240 Volt, 9.05kW, 37.83 amps.

Rating plate—rear section of grill compartment.

Terminal Loadings

A.1 1250W hotplate — 3350W oven (max.);
4.6kW, 19.2 amps.

A.2 2050W hotplate — 2400W grill-hotplate;
4.45kW, 18.5 amps.

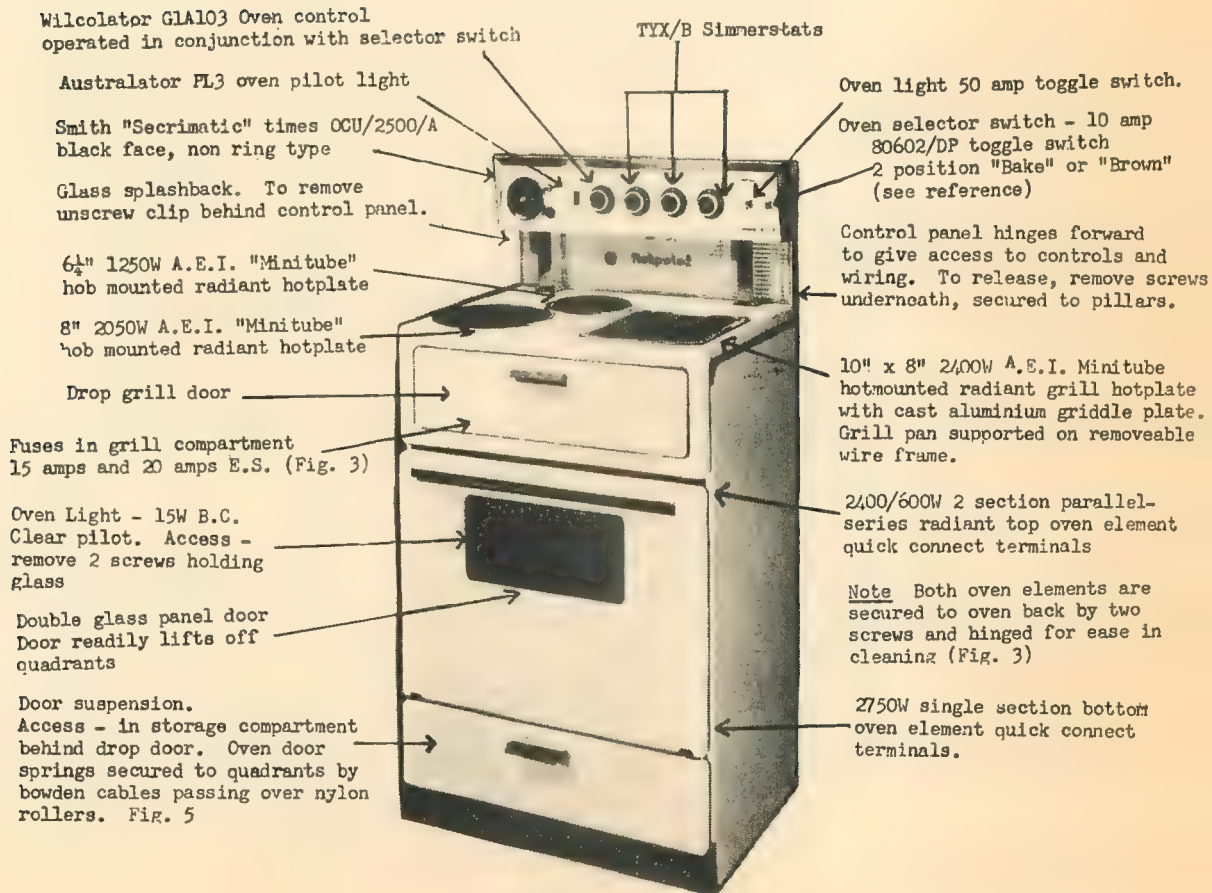


Fig. 1

ITEM No.81.(CONTINUED).

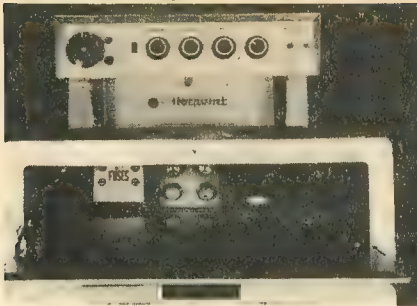


Fig. 2

Grill door open, rating plate on fuse cover moved to the left showing fuses. Oven vent through top of oven into grill compartment.



Fig. 3

Top oven element holding clip released, reflector tray removed and element hinged down for cleaning of oven top. Bottom oven element in normal position. Also shown is the position of the oven thermostat bulb, oven light and door gasket. The oven door gasket fits behind return of oven lines and can be replaced by slackening off four slotted nuts at rear of oven and easing liner forward.

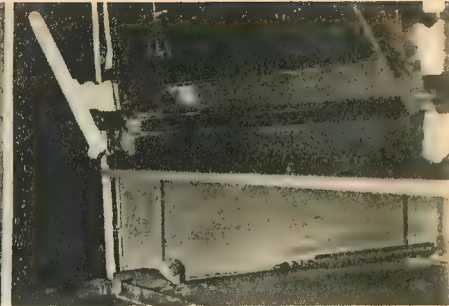


Fig. 5

Oven door removed by wedging door open with two screw drivers between quadrants and frame, then lifting door upwards off quadrants. Storage compartment door open showing bowden cable, nylon rollers and spring.

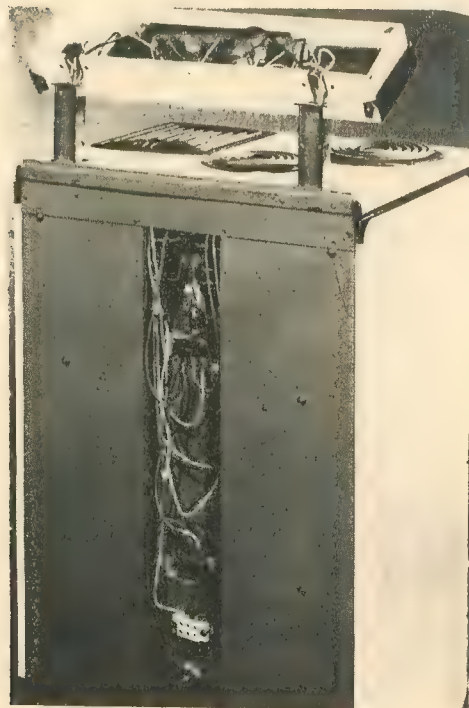


Fig. 4

Back panel sections removed showing conduit entry at bottom, main terminal block, oven connection and general wiring. Control panel hinged forward giving access to controls and wiring without moving range.

1. Oven Controls

Model RF3GA only Wilcolator G1A103 with Selector switch.

- a. Preheat—Selector switch to "Brown". Thermostat at required temperature.
(T.O.E. sections in series and in parallel with B.O.E.)
- b. Bake—Selector switch to "Bake". B.O.E. only.
- c. Grill—Selector switch to "Brown". Thermostat to "Grill". T.O.E. sections in parallel.
- d. Brown—Same operation as Preheat.

2. Other Models

- a. R.F.3G "Standard" Model.

Rating

240 Volt, 8.45kW, 35.2 amps.

Terminal Loading

A.1 1250W hotplate — 2750W oven, 4kW, 16.66 amps.

A.2 2050W hotplate — 2400W grill hotplate 4.45kW, 18.54 amps.

Same as De Luxe but no "Secrimatic" timer, no 2-position selector switch and no top oven element.

Wilcolator G1-113 replaces Wilcolator G1A-103 and Type M, D spindle. Arrow three heat switch replaces simmerstat for control of 1250W hotplates.

- b. R.F.3 "Special" Model

Rating

240 Volt, 8.45kW, 35.2 amps.

Terminal loading and construction similar to "Standard" model but no glass panels in oven door, no oven light. Arrow three heat switches replace simmerstat control on both hotplates.

ITEM 82

SIMPSON "Tappan" Upright Cabinet Electric Range

Ambassador E24 Model

Rated at 240 Volts A.C.
10kW 41.6 amps

Terminal loading:

A.1 3000W grill hotplate, 2100W radiant hotplate: 5.1kW, 21.2 amps.

A.2 1250W radiant hotplate, 2700W bottom oven element, 1000W power outlet; 4.9kW, 20.4 amps.

Range terminal block in control panel (Fig. 3)

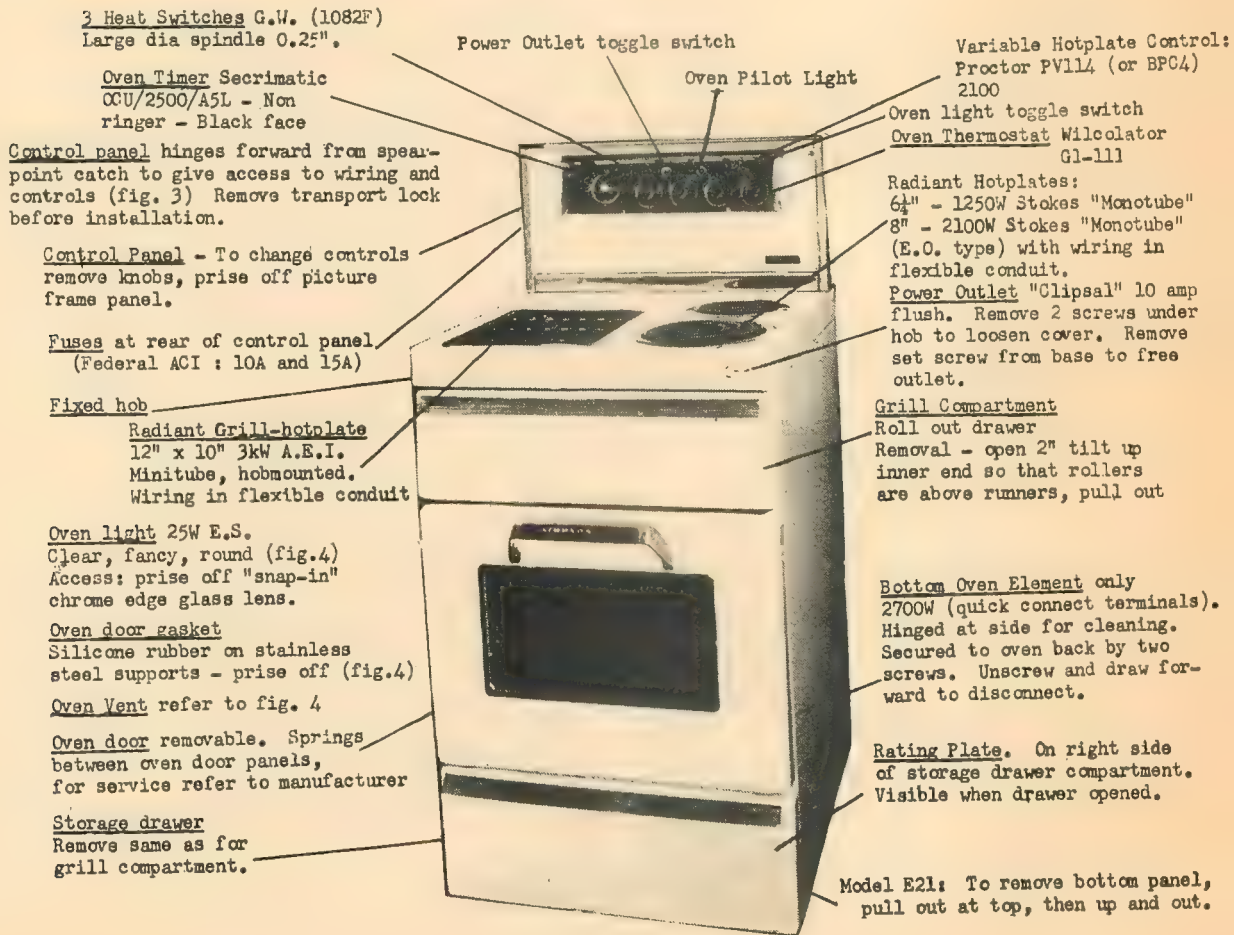


Fig. 1

ITEM 82 (CONTINUED)

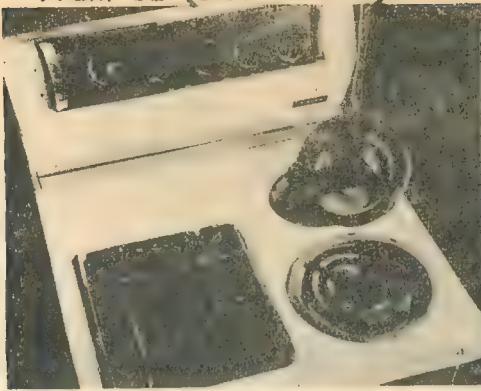


Fig. 2: Hob with 1250W hotplate drawn through opening showing hotplate terminal block also picture frame control panel.



Fig. 3: Control panel hinged forward with both back panels removed showing main terminal block, fuses, controls, oven light receptacle connections to bottom oven element and wiring. Conduit entry can be seen in back of hob also beneath main terminals. Spearpoint catch for locating control panel is situated to left of conduit entry.



Fig. 4: Bottom oven element disconnected showing quick connect terminals. Element pivots for ease in cleaning on base at rear and front; pivot strap attached to element guard. Guard attached to element by clips secured by self tapping screws. Oven door gasket silicone rubber on stainless steel strips, ends spring into holes. Oven vent through 9" gap in top door gasket. Oven light (prize-out glass) and thermostat bulb on rear of oven.

1 Other Models

"Arizona" E23—Rated at 240 Volt A.C.; 10kW, 41.6 amps. Same as Ambassador minus timer and oven light.

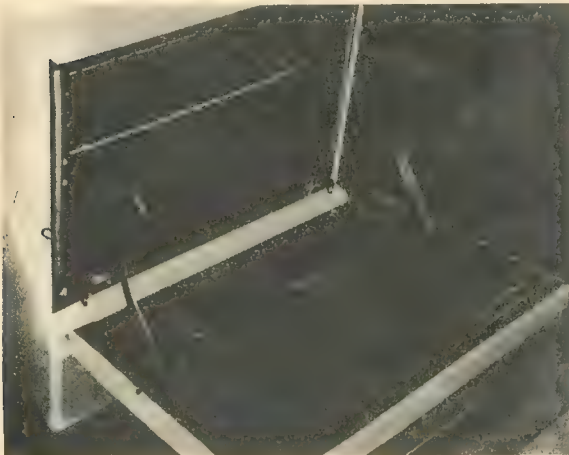
"Belvedere E22"—Rated at 240 Volt A.C.; 8kW, 33.3 amps. Smaller model than the Arizona having 10" x 8" 2400W A.E.I. minitube radiant grill-hotplate and 2200W bottom oven element only. Also minus picture frame instrument panel and 1000W power outlet.

Terminal loading:

- A.1 2100W radiant hotplate, 2200W bottom oven element; 4.3kW, 18 amps.
- A.2 1250W radiant hotplate, 2400W radiant grill-boiler; 3.65kW, 15.3 amps.

"Boston" E21—Rated at 240 Volt A.C.; 8kW, 33.3 amps. Same as Belvedere minus surround around splashback and cover replaces storage drawer.

Fig. 5: Oven door removed to simplify cleaning or servicing. Quadrants are secured against spring tension by temporary locking pins. Refer to reference 2.



2 Oven Door

(a) Removal: Door hinges on rod engaging in two external slotted brackets below oven. Fully open door and place temporary quadrant locking pins through holes on both door quadrants. Raise door to within 3" of closed position, lift up and out to disengage hinge rod from brackets. Withdraw quadrants through slots in oven surround. To replace door, hold vertically, fit quadrants through slots and lower until hinge pins engage in brackets. Open door and remove pins.

(b) Adjustment: Remove oven door as (a). Adjustment can be made by turning adjusting screws situated in lower edge of door, thus altering spring tension on quadrants.

SECTION 2.
ITEM No.83.

St. George built-in Ovens and Bench Top surface units

Model W.D.R. Wall Oven

Rating:

Rated at 240 Volts
4.54kW 18.9 amps

Terminal loading:

A.1 Oven elements, 4.1kW, 17.1 amps
A.2 Warmer drawer, oven light, 0.44kW, 1.8 amps.

Controls and wiring

Access - Remove fixing screws, draw over forward about 6", remove cover plate (Fig. 5)

Timer - Smith's "Securimatic" OCU/2500;A2

Oven Vent - through top of oven into space behind control panel

Oven Door - Double glass panel, drop down type door with ajar position for grilling.

Door Gasket - secured to door by spring clips. Prise off.

Door Spring

Access - remove warmer drawer

Oven Light

60 watt E.S.

Access - Slide glass cover upwards, pull forward and down from bottom

Pilot Lights (Neon) for Rotisserie and warmer drawer

Push Switches - Tecino 3 amp, controlling rotisserie, oven light and warmer drawer.

Grill control. Microheat control switch
Thermostat first set to "Broil"

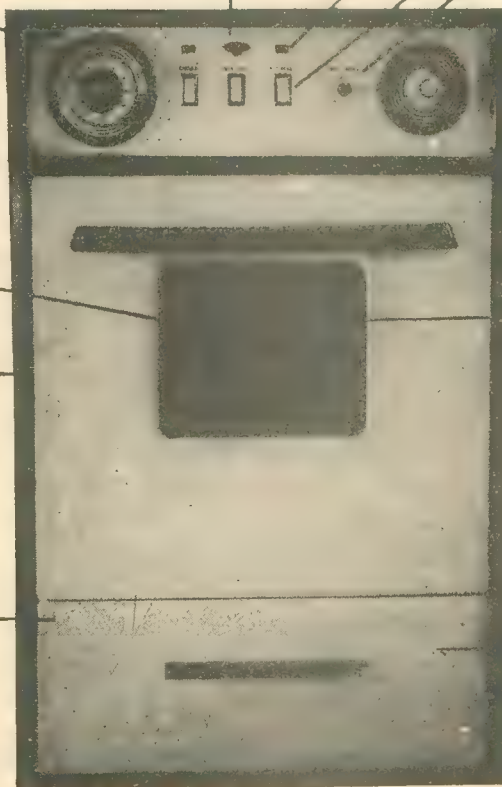
Thermostat - Robertshaw Fulton, 2 stage

Top Oven Element
2500W single section tubular plug-in type.

Rotisserie. Rotating frame can be detached from motor drive by lifting front handle and pulling forward. (Motor and attachments similar to "Rotomaster")

Bottom Oven Element
1600W single section tubular, plug-in type

Warmer Drawer Element. 400W, single section tubular plug-in type.
Access - Remove drawer pull forward and lift.



Main terminals, rating plate and "Federal" A.C. fuses in warmer compartment
Access - Remove warmer drawer. (Fig. 6)

FIG. 1.

BENCH TOP SURFACE UNITS

Model F.C.B. (Remote Control)

Rating:

3 hotplate unit rated at 240V (Fig. 2), 5.45kW, 22.7 amp. single terminal.
4 hotplate unit rated at 240V, 6.7kW, 27.9 amps.

Terminal loading:

3.35kW, 13.95 amp. per phase with oven must be balanced over three phases.
Fits into recess with chrome surround, secured to cupboard by turn over clips.



FIG. 2.

1. Hot Plates

A Type — Two 2100W, one 1250W "Corox" plug-in radiant hotplates with black vitreous enamel reflectors. Additional 1250W hotplate on 4 hotplate model.

B Spillage pans — Individual vitreous enamel deep spillage pans secured in position by clips beneath each hotplate. Pans cleaned in position for access plug out hotplate.

C Access to hotplate sockets and wiring — Through hotplate openings after removal of spillage pans. To remove spillage pan, turn about $\frac{1}{4}$ turn, straighten clips, lift clear of hob.

2. Flexible Control Box

A Controls — Satchwell B.P.C.I. simmer controls of required rating in recessed box wired to unit through flexible conduit.

B Mounting — Control box can be mounted in any

position to suit customer, Fig. 2 shows box recessed in cupboard front under unit.

C Access to controls — Remove knobs and escutcheon plate, take off clips securing control box then slide controls out or back into recess. Remove back cover.

3. Fuses, rating plate and main terminals

A Position — Under unit at front.

B Access — Open cupboard door and remove cover plate.

C Fuses — Federal A.C.I. 15 amp.

4. Pilot Light

A Type — "Lumalite" pilot light common to all hotplates fitted only to later F.C.B. models. $\frac{1}{2}$ meg. resistor connected across pilot light.

B Connection — When common pilot light is connected to B.P.C.I. super switches polarity must be reversed. When replacing super switch follow original connections diagram on switch to be disregarded.

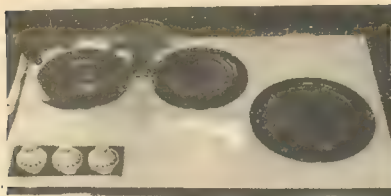


Fig. 3. T.S.M. 3 hotplate model with 1250W radiant hotplate and reflector removed and showing deep spillage pan.



Fig. 4. T.S.M. surface unit removed from cupboard showing fuses and rating plate also switches lifted from recess in hob.



Fig. 5. Oven viewed from top back, cover plate removed to show mounting of controls and wiring also position of oven vent.

Model T.S.M. (Integral control) see Fig. 3

- 3 hotplate model rated at 240 Volt, 4.6kW, 19.2 amps. Single terminal.
- 4 hotplate model rated at 240 Volt, 6.7kW, 27.9 amps. 13.95 amps per phase.



Fig. 6. Oven interior showing bottom oven element unplugged oven light top left corner, thermostat bulb and top oven element. Rotisserie also shown in operating position, to remove draw forward from motor drive.

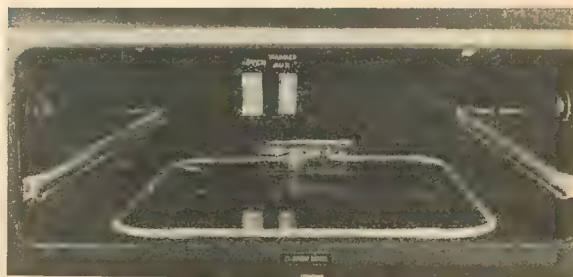
1. General design

Similar in construction to F.C.B. models with no pilot lights. 3 hotplate unit having two (2) 1250W and one (1) 2100W radiant hotplates.

2. Controls

- A Location* — Recessed in hob towards front, Fig. 3.
- B Access* — Remove knobs and escutcheon plate, take out two screws holding switch mounting bracket, lift out (fig. 4), if necessary disconnect earth.

Fig. 7. Oven Unit — warming drawer removed showing fuses, warming drawer element and rating plate.



SECTION 2.
ITEM No.84.

RODEN ELECTRIC RANGES

"66" and "45" Upright Cabinet Models

Model "66" (fig. 1)

Rating — 240 volt, 7.1kW, 29.5 amps. Rating plate on plinth beneath oven door.

Terminal Loading

A.1 — 8", 2100W—6 $\frac{1}{2}$, 1000W "Corox" radiant hotplates, 3.1kW, 12.9 amps.

A.2 — 10" x 8", 2000W cast grill hot plate 2000W radiant oven element—4kW, 16.6 amps.

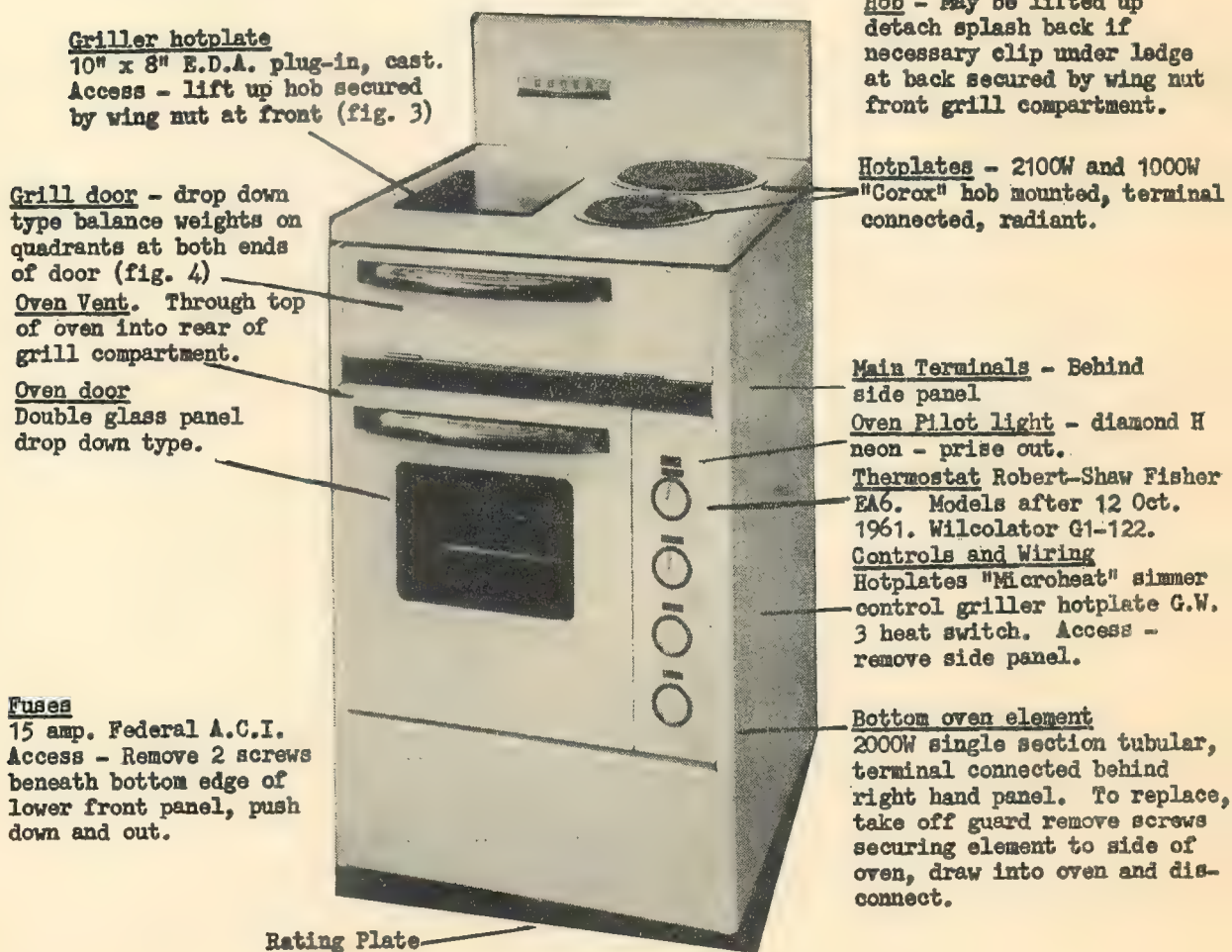


Fig. 1



Fig. 3 Hob tilted back, grillier hot-plate withdrawn from contact block and wing nut for securing hob.



Fig. 4 Side panel removed showing balance weight on grill door, spillage deflector over controls, oven element connections, main terminal quadrants and springs also slotted conduct entry in back panel.

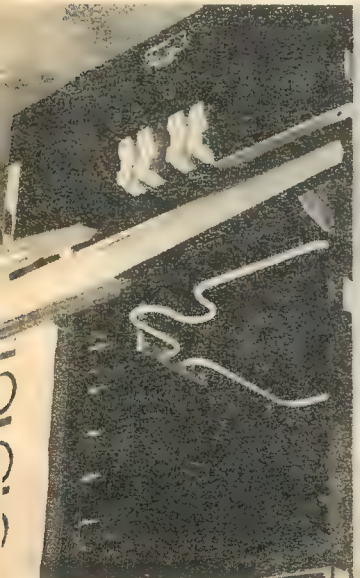


Fig. 5 Oven door open, lower oven panel and element guard removed showing oven element screwed into position, thermostat bulb, fuses and rotating plate.

Fig. 2.



2. Other Model
"45" Upright Cabinet Model (fig. 2)

Rating 240V. 6.1kW 25.4 amps.

Terminal Loading

A.1 Hoiplates 4.1kW 17.1 amps.
2.0kW 8.3 amps.

Similar to "66" model minus 1000W hoiplate. Hob is hinged, microheat control is replaced with Proctor control on hoiplates. Oven element although rated at 2000W is smaller in physical dimensions. Fitted with either all metal or glass panel door.

SECTION 2. ITEM No. 85.

Simpson "Tappan" E27 "Fabulous 400", bench or wall mounted model, rated at 240V, 13.0kW, 54.1 amps.

Terminal loading

- A1. Left oven 3000W. (max.) — right oven 1875W. — oven light 40W. — clock and transformer. Total—5.1kW., 21.4 amps.
A2. Right power outlet 1000W. — 8" hotplate

2100W. — 6 $\frac{1}{4}$ " hotplate 1250W. Total — 4.35kW, 18.1 amps.

- A3. Left power outlet 1000W. — 2 x 6 $\frac{1}{4}$ " hotplates 1250W. each — panel lights — rotisserie motor. Total 14.6 amps.

BANQUET OVEN

ECONOMY OVEN

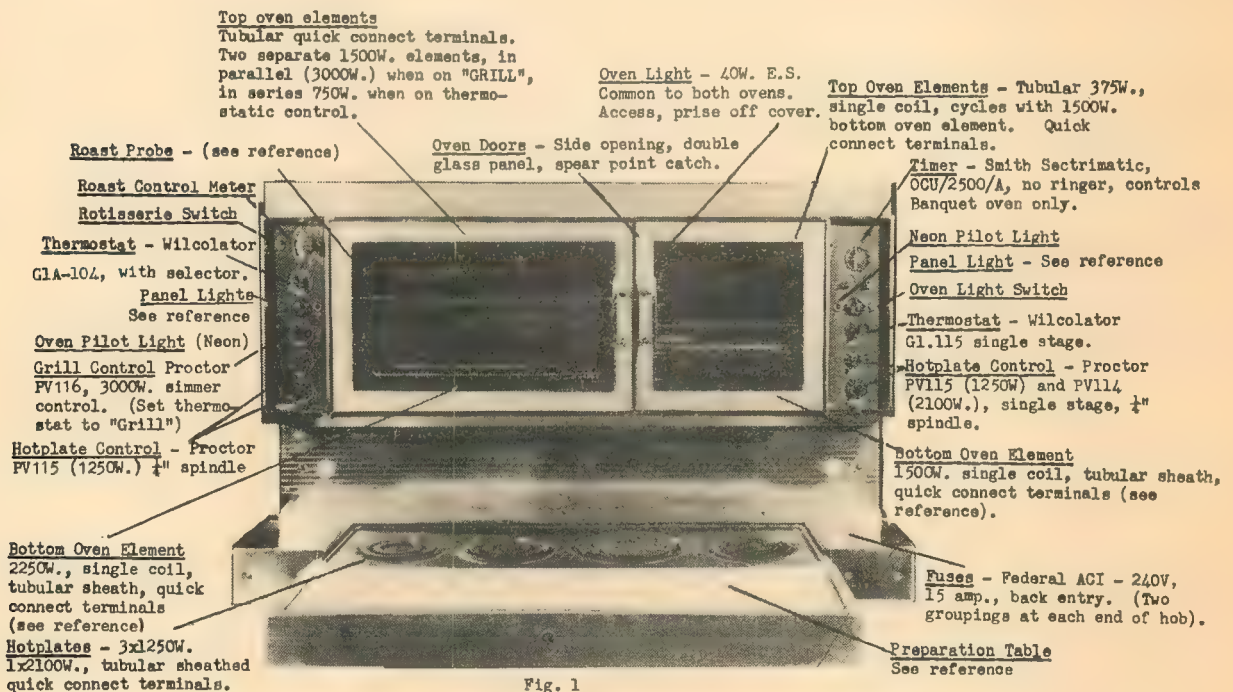


Fig. 1

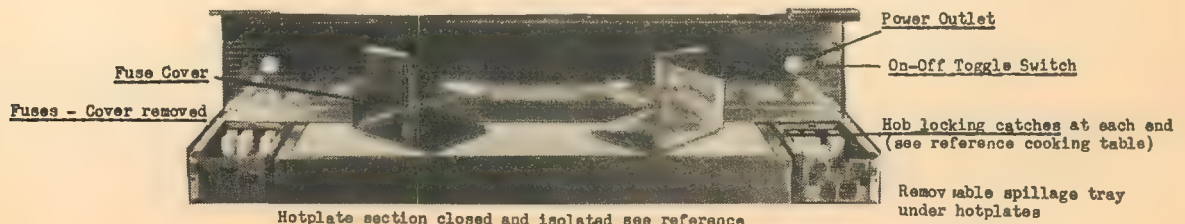


Fig. 2



Fig. 3

Left hand control panel. Right hand panel similar, Smith Sectrimatic replaces "Roast Control".

1. Mounting

This model can either be:—

(a) *Secured to wall*

- (i) Angle bar supplied to be bolted to wall.
- (ii) Fit three pins at top of range back into holes in angle bar.
- (iii) Adjust vertically by adjusting screws at rear and bottom of range.

(b) *Mounted on cupboards*

2.

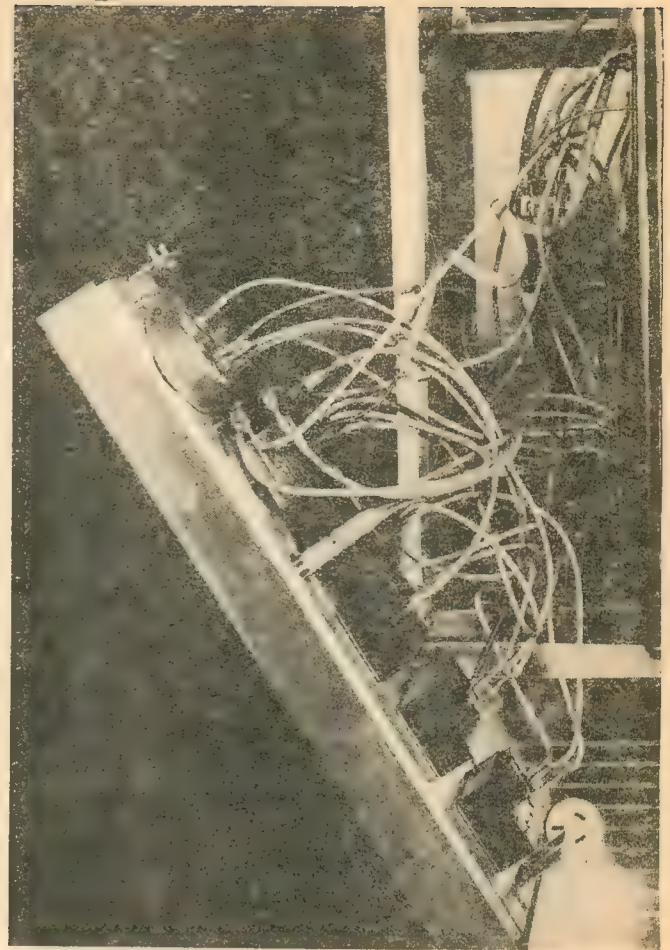


Fig. 4

Control panel removed from range showing wiring controls and rotisserie motor (see reference). Thermostat capillary tube covered to prevent contact live terminals.

2. Rating plate

Situated on range frame beneath spillage tray. Access — withdraw spillage tray and reflector from 2100W. hotplate.

3. Main terminal block

Situated behind aluminium splash back. Four-way porcelain block with double screw terminals. Conduit entry from either rear or beneath range.

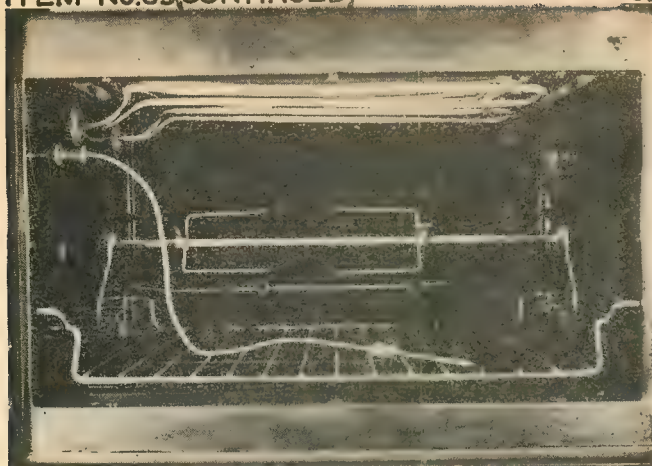


Fig. 5

Shows interior view of Banquet oven with rotisserie shaft mounted on supporting frame attached to oven slide. Also "Roast probe" plugged into socket, position of thermostat capillary tube, oven light and elements.

SERVICING THE ELECTRIC RANGE

(continued from page 37)

4. Cooking table

Hotplates can be pushed in when not required; locks in open position.

(a) Table operation

Draw forward until hob locking pins rise. To close, raise preparation table to horizontal position, depress both locking pins and push in.

(b) Isolation

Interlocked electrically by means of micro-switches to prevent table being pushed in with hotplates alive, but table can be closed while hotplates are still warm. Access to micro-switches, remove aluminium splash-back.

(c) Service to hotplates

Hotplates surround rings held in by fold over clips. To service, release clips and withdraw complete hotplate from hob.

(d) Preparation table

To lower, lift rear edge clear of slots and hinge down. To remove laminex table top, take out thumb screws beneath table top.

5. Control panel

(a) Panel lights, 15W. B.C. behind escutcheon plug in centre of each panel operated by common switch.

Access — To remove plug, turn 90° to left and withdraw.

(b) Access to switches and wiring—panel held by two plug pins at top, and screw under-

neath panel engaging in slotted bracket at bottom. Prise out chrome plug covering bottom screw, loosen off, pull panel out at bottom and lower from plug pins at top. To remove any control from panel, first remove switch knobs, take out four self-tapping screws holding glass indicating panel.

6. Oven general

Elements—single coil type pivot secured to side of oven by two screws. Bottom elements hinge at rear for ease of cleaning.

(a) Removal

(i) Bottom oven element — remove four screws securing baffle — guard to element, take out screws securing element to side, draw into oven and disconnect quick connect terminals, slide off pivot.

Note: Do not unscrew pivot pin as loose nut will fall into oven cavity.

(ii) Top oven element (Economy oven)—spring coil from clips, remove screws holding clamp, draw into oven and disconnect.

(iii) Top oven element (Banquet oven)—remove self-tapping screw holding element to stainless steel reflector; remove screws securing element to side, draw into oven and disconnect. Each section of element is a separate interchangeable unit.

7. Operation of ovens

(a) Economy Oven—Not controlled by automatic timer, both elements in parallel, thermostat set at required temperature; cannot grill.

(b) Banquet Oven — Control by Wilcolator GIA/104 with selector switch incorporated, bulb along back.

(i) Bake—Set times to 'Manual' or 'Automatic' as required, thermostat set to required temperature (top elements in series, bottom oven element on, pilot light in circuit).

(ii) Grill—Timer on 'manual', thermostat to 'Grill', pilot light off until 'Grill' Proctor control switch is turned 'on'. 'Pilot light' cycles unless on 'Full'.

(iii) Rotisserie—The rotisserie set is driven by a geared motor located at left hand

ITEM NO.85 (Continued)

SERVICING THE ELECTRIC RANGE.

side of oven. Can be detached from motor by lifting up clear from gears and supporting frame (Fig. 5). Operate as for 'Grill' with rotisserie switch on.

8. Roast Control.

(a) Consists of:-

- (i) A meter with scale indicating degrees of roasting (Fig. 3).
- (ii) A thermocouple probe which is inserted in the roast and which controls a 12 volt A.C. circuit (from transformer), switching the 240 volt relay in the oven circuit (Fig. 5).
- (b) Setting - after setting oven thermostat in normal way, turn setting points to desired position. As roast cooks, second indicator pointer rises. When it reaches setting, pointer trips relay and buzzer rings until thermostat is turned off. (Oven pilot light cuts in and out in normal way during cooking.)
- (c) Probe plugs into special outlet socket in oven wall. Thermocouple is in small spear head. Push into roast horizontally, so that spearhead is approximately in centre of thickest part of roast, but not in fat or seasoning, as this gives a false reading.

9. Oven Vent.

Through gap between top of oven door and frame.

10. Door Gasket.

Silicone rubber on stainless steel strips. Ends spring into holes, prise out ends.

SECTION 2.
ITEM N°86.

Servicing The Electric Range

CONTINENTAL AUTO-4 CABINET TYPE RANGE.

Rating	kW Amps. Cable	12.9 54.0 7/.036	Rating Plate —Remove spillage tray under hotplates. Plate on floor of compartment.
Terminals —Amps. Cable BOE, 8" h.p., 6¼" h.p., O/L. TOE, 2 x 6¼" h.p.	A1 A2	7/.029 28.0 26.0	Main Terminals —Rear of range behind hotplate section.

Controls — Controls and fuses on pull out tray. Remove spillage tray, take off 2 screws securing floor of spillage compartment to fascia, pull control tray forward, remove screws securing control chamber cover to back of fascia. Controls on sub-panel behind glass. Remove glass fascia for access to holding nuts or screws. Take out screws each end and lift off surround. Pull off all knobs, lift off glass.

Timer (Tech/D) — Smiths OCU/2500/-. Replace with OCU/2500/A3. Necessary to convert to R.H. and remove front cover plate.

Individual Pilot Lights (v) — Lumolite FP11-FL. Secured to sub-panel by speed-nut.

TOE (Tech/D) — Corox P.I. 3000 W. 13½" x 10" + 2½". Pin through bracket on side of block opening. Pin holds element into block.

BOE (Tech/D) — Corox P.I. 2500 W. 15½" x 11½" + 1½". Held into socket block as for TOE.

Access Socket Block TOE and BOE — H.P. Mk. 1 (v). Remove rear cover. To remove block, disconnect earth strap at rear, remove two screws in centre vertical plate in oven and pull into oven. Block secured to plate by nut.

Oven Light (v) — 2 x 15 W. E.S. At back of oven. Recessed for protection.

Hob — Removable for access to socket blocks and common hotplate neutral. Plug out all hotplates, pull hob forward from rear clips and lift off.
Oven Door — Glass in metal frame. Drop type, non-removable.

Oven Vent — Through oven side near top, into hotplate spillage compartment. Removable for cleaning. Remove TOE pull vent into oven.

Hotplates — Corox Mk. 1 (Van Mk. 111) 1 x 8" and 3 x 6¼". **Socket Block** — Mk 1 type secured by two screws to bracket under hob. Access lift hob (see above).

Fuses (v) — 20A Federal A.C.I. Access: remove spillage tray and two screws securing floor of spillage compartment to fascia. Pull forward fuses on tray behind switches.

H.P. Controls (v) — Sunvic TYJ-01A infinite control.

TOE Control (v) — Sunvic TYJ-01A infinite control.

Thermostat — Wilcolator G1-141. Replace with Van E.A.3. Mounted by two screws. E.A.3 fitted with terminals on top. May have to pack with washer for correct spindle length.
Oven Light Control (v) — 3A arcolelectric toggle secured to sub-panel by nut.



Continental Auto-4

"CONTINENTAL" HOTPLATE UNITS & WALL OVENSHOTPLATE UNITS:

Model	kW	TERMINALS		8"	H.P.		R.G.B.
		A1	A2		6 1/4"		
2nd Flaming Top	5.0	10.4 Amps.	10.4 Amps.	-	2		-
3 plate " "	4.55	10.4 "	8.7 "	1	2		-
4 plate " "	5.8	10.4 "	13.75 "	1	3		-

Controls - Centre bush mounted to top of hob. C.P. escutcheon held by 2 screws. Nuts on upside down. Fit spanners to inside of nut to remove. Cover over wiring etc. held by 2 screws.

Hob - Hinges up for access to controls etc. Prop holds hob in raised position.

Wiring, Main Terminals - Below cover on bottom of unit below controls.

Conduit Entry - Through back or bottom of unit.

A1 - 2 x 6 1/4" H.P.s; A2 - R.G.B. or 1 x 8" H.P., or 1 x 8" H.P. and 1 x 6 1/4" H.P.
1 ph. - 7/.029.

Fuses - 20A Federal AC1. Behind push on covers on side of sw. compartment.

WALL OVEN UNITS:

Model	kW	TERMINALS		Timer	Rotiss.
		A1	A2		
Standard	4.0	8.3 Amps.	8.3 Amps.	M.M.	-
De-Luxe	4.0	8.3 "	8.3 "	X	X

Controls - Centre bush mounted. Access - Remove glass cover over fuses, loosen screw holding C.P. plate between glass panels, pull out plate. Remove knobs, lift off glass. Remove screw holding sub-panel, hinge down.

Oven Vent - Into compartment above oven.

Wiring, Main Terminals - Behind glass cover with fuses at bottom of switch panel.

Conduit Entry - Through bottom of terminal box.

A1 - TOE; A2 - BOE. 1 ph. - 1/.064.

Fuses - 20A. Federal AC1. Behind glass panel at bottom of switch compartment.

"CONTINENTAL" UPRIGHT RANGES:

Model	kW	TERMINALS		H.P.		Timer	Rotiss.
		A1	A2	8"	6 1/4"		
Garnet	9.8	16.6A	24.1A	1	3	M.M.	-
Garnet De-Luxe	9.8	16.6A	24.1A	1	3	X	X

Controls - H.P.'s - Mounted on top of hob. Access to nut, remove knob.

Wiring etc. Lift hob, remove 2 screws holding cover. Oven - Behind glass on sub-panel down side of oven. Access, remove all knobs and plastic cap nut, lift off glass. Remove top sub-panel screw, hinge down.

Hob - Hinges up for access to socket blocks etc. Lift at front, prop attached to hob holds in raised position.

Oven Door - Glass in metal frame. Drop type. Non removable.

Oven Vent - Into spillage compartment below hotplates.

Wiring, Main Terminals - Behind cover near oven fuses. Conduit Entry -

Through back and up into bracket below main terminals.

A1. TOE, BOE, A2. 1 x 8" H.P., 3 x 6 1/4" H.P.s. 1 ph. - 7/.036; 2 ph. - 7/.019.

Fuses - 20A. Federal AC1. H.P. - On side of control chamber. Lift hob for access. Oven - Behind lower glass (remove bottom cap nut) at bottom of oven controls.

SECTION 2
ITEM N° 87

Everhot "Vermont"

E8S Upright, 3-hotplate, Minute Minder.

Rating: 240-volt.- 8.15kW. 33.9 amps. 7/.036 cable.

As "Brookwood" model without timer, rotis-

serie, cook top (hob) light, top oven element, storage drawer. Bottom oven element rating increased from 2kW to 2.5 kW.

Everhot "Montclair"

E9A Wall-mounted or bench top unit.

3 hotplate, Automatic.

Rating: 240-volt. 8.25kW. 34.4 amps. 7/.035 cable.

Terminal Load: As for "Brookwood" model.

Rating Plate: Behind fold-back splashback at rear of slide-out hotplate unit. Access, draw hotplates forward to full open position—press splashback back.

Controls: Hotplates: As for "Brookwood" model.

Oven: On control panel behind glass fascia.

Access: Timer: Take out two screws holding top panel, slide panel to rear, lift off. Pull off timer knobs, take out four screws holding timer mounting plate, withdraw mounting and timer through rear.

Other Controls: Remove top panel, take out two screws holding top front trim, pull trim forward (top light cover glass could slide forward and be broken if care not taken), remove light cover glass. Pull off all knobs, remove screws holding light mounting plate, lift light clear, lift out glass fascia, release holding screws or nut, withdraw controls through rear.

Light Control: G.W.-W15/4020 Rotary three-position switch. (Top-top and oven-oven.)

Ballast: 15W. "Soltra". **Starter:** 10W, "Pemsoc". Behind control panel. Access, remove top panel.

Top Light: Philips 15W. 18" x 1" fluorescent. Access, remove top trim.

Oven Elements: As for "Brookwood" model.

Door Springs: Either sides of oven. Remove top and rear panels for access.

Oven Door: Full glass. Cannot be removed. Pull forward and up. Door glass can be hinged down to permit cleaning of inside. With door closed, press release buttons on top edge. To resecure, hold closed tightly at top, slightly pull out door at bottom.



Rotisserie Control: G.W.-W15/2054 rotary on-off switch.

Timer: G.E. AST19. Type 118.04.

Thermostat: Wilcolator G1-141.

Pilot Light: Lumalite FP113. Secured in rubber grommet.

Rotisserie: Warner Drayton 27/25. Access, remove top panel, take out two screws holding motor, lift off vertical drive rod.

Fuses: Federal 15A, AC.1. Access, slide hotplate unit to full open, press splashback back.

Hotplates and Controls: As for "Brookwood" model. Rear hotplates controlled by isolating switch — see hotplate unit.

Grill Compartment: As for "Brookwood" model.

Hotplate Unit: Press manual release and pull forward. Three positions: 1. Fully closed; 2. Partially forward — Grill hotplate only. Isolating switch open; 3. Fully forward — Isolating switch closed, all hotplates available.

Servicing The Electric Range

Everhot "Brookwood"

E&A Upright, 3-hotplate Automatic.

Rating: 240-volt. 8.25kW. 34.4 amps. 7/.036 cable.				
Terminal Load	kW	amps	Cable	
—Original A1	5.7	23.8	7/.029	6½", 8" and grill hotplate.
A2	2.55	10.6	7/.029	Oven rotisserie and lights.
—Modified A1	4.45	18.6	1/.064	6½" hotplate transferred to A2.
June, 1965				
A2	3.8	15.8	1/.064	

Rating Plate: Right-hand side of grill compartment.

Oven Control Panel: Hinges forward — held secure by two 3/16" wing nuts in rear of grill compartment. Access to wing nuts either through front of grill compartment or through hotplate opening.

- **Controls: Hotplates:** On hob. For access, take out two screws holding cover in grill compartment, remove cover. Pull off knobs, remove centre nuts, draw into grill compartment.
- **Oven Timer and Lights:** On control panel behind glass fascia. Access, tilt panel forward, remove rear panel. Timer-Thermostat and pilot-light controls mounted on separate mounting plates. Each mounting plate held by four screws.
- **Fuses:** Four 15-amp. Federal AC.1. Behind cover plate in grill compartment.

Top (Hob) Light: Philips 15W., 18" x 1" fluorescent. Access — remove rear panel.

Ballast & Starter: "Soltra" 15W. Ballast, "Pemsoc" 10W. Starter. Access, remove rear fascia panel.

Oven Light: 25W. E.S. Right-hand side behind wire guard.

Hotplates: Single circuit. Left — 8" x 2050W. Radiant — G.E.P. 2189G2. Right — 6½" x 1250W. Radiant — G.E.P. 2188G2.

Grill Hotplate: Two-Circuit 15" x 7½" x 2400W. G.E.P. 1014G4, hinged. Remove hinge pivots, lower into grill compartment to disconnect.

Rotisserie: Warner Drayton 27/25.

Access: Remove bottom rear panel, take out four screws, draw out through rear, change over collar.

Oven Door: Full glass — lift off. To remove: Open door, swing hinge tabs to lift position, close door on tabs. Close door a little further, lift straight up and off.



Light Control: G.W. rotary 3-position switch, W/15/4020. (Top-Top and Oven-Oven.)

Rotisserie Control: G.W. rotary on/off switch, W15/2054.

Thermostat: Wilcolator G1-141.

Pilot Light: Lumalite FP113. Held in position by rubber grommet.

Timer: G.E. AST19. Type 11804.

Hotplate Controls: Proctor.

	Guar.	Non-Guar.
Left	PV150	PV107
Right	PV158	PV110
Grill	PD102	PD103

Divided control.

Grill Compartment: Drop-down door. Three-position, slide-out grill. Adjustment made by moving control arm right-hand side.

Oven Elements: Top: 500W. Radiant. Stokes 90531, U-shape. Remove screws holding element to oven liner, draw forward — disconnect.

Bottom: 2000W. Radiant. Stokes. Hinged. Remove 2 screws holding wall plate, draw forward, disconnect.

Servicing The Electric Range

Everhot Upright and Eye Level Ranges

Model	Model No.	kW	Type	H.P.	R.G.B.	T.O.E.	B.O.E.	Rotiss.	Timer
Barclay	E13/ARL	8.14	Eye level	2	X	X	X	X	X
Camden	ER/AL	8.14	Eye level	2	X	X	X	—	X
Camden	ER/A	8.14	Eye level	2	X	X	X	—	X
Kenleigh	E11/ARL	8.35	Upright	2	X	X	X	X	X
Kenleigh	E11/AR	8.35	Upright	2	X	X	X	X	X
Winton	E10/AL	8.35	Upright	2	X	X	X	—	X
Winton	E10/A	8.35	Upright	2	X	X	X	—	X

	E13/ARL	E12/A E12/AL	E11/AR E11/ARL	E10/A E10/AL	Service Information
RATING kW amps.	8.14 } 7/.036 33.9 }	8.14 } 7/.036 33.9 }	8.35 } 7/.036 34.8 }	8.35 } 7/.036 34.8 }	Rating Plate — on L.H.S. of grill compartment.
TERMINAL — Amps. 6½" H.P. + Oven A1 8" H.P. + R.G.B. A2	15.35 } 1/.064 18.55 }	15.35 } 1/.064 18.55 }	16.25 } 1/.064 18.55 }	16.25 } 1/.064 18.55 }	Main Terminals — Back of oven behind cover. Conduit Entry —Through bottom of rear cover.

Controls—Hotplates

On hob. Centre-bush mounted, access, remove two screws in front of cover in grill compartment, pull straight out. Back held by wiring channel. Pull off knob for access to nut.

Thermostat, Timer, etc.—Eye level. Mounted on sub-panel, behind glass fascia. Access, remove top panel. Remove four screws holding sub-panel to C.P. surround. Remove end-cap frame to remove oven vent, replace to support glass. Lift out sub-panel. Upright — Remove eight screws holding sub-panel, lift-out.

Hob—Lifts up for access. Supports hinge off side of grill compartment.

Oven Door—Kenleigh, Winton—Lift-off type. Full glass in C.P. frame. To remove, open door, turn down locking stops on each side, close door onto stops, when bottom of door moves out, lift the door straight up.

Barclay—Full glass in C.P. frame. Door will open down by pressing button on each top corner. The lock is disengaged allowing door to be lowered forward.

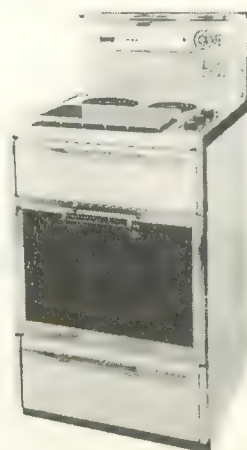
Camden—Full glass in C.P. frame. Non-lift-off; hinges off side.

Fuses—20A Federal AC1. Behind cover at back of grill compartment.

Selector Switch—G.W. W15402001. Selects Rotiss., O/L or both. (previous Brookwood) Access see controls above.

T.O.E.—G.E.P. Q.C. term. 600W 11½" W x 12¾" D. Held by two screws through wallplate and clip at front.

B.O.E.—Stokes Q.C. term. Hinged, 2000W 14½" W x 11¾" + 1½" D. Remove two screws through wallplate.



● Kenleigh E11/ARL

Hotplates—G.E.P. P.I. 8" x 2050W; 6½" x 1250W.

Socket Blocks—Fitted to hob by two screws. Cover over wiring channel held by two screws.

Note: Neutral link located in wiring channel which has all H.P. Neutrals connected to it.

Thermostat—Wilcolator G1-197 or G1-187. Access; see controls above.

Timer—G.E. 3AST19—Previous Brookwood with new face on old timer. Remove hands, pull off face. Fit to new timer.

Rotisserie—Eilbeck and Co. (used previously Metters 295 eye level models)—motor mounted on top of range. Spit driven by shaft and gear drive. Other models—mounted behind rear panel.

Oven Light—25W E.S. guard over globe fits into holes in oven liner.

Pilot Lights—Hotplate—Lumolite FP7 F/D Oven—Elmaco. Held to panel by speed nut.

Controls—
8" H.P. — kV 154 { Access;
6½" H.P. — kV 153 { see
R.G.B. — PD115 { controls
above.

Radiant Grill Hotplate—G.E.P. hinged 2400W 15" x 7½". Hinge fixed to hob by two screws.

Servicing The Electric Range

New World ER42/1, ER43/1 Upright and ER44/1 Elevated Ranges

	Model	Type	kW	H.P.	G.H.P.	B.O.E.	T.O.E.	Rotiss.	O/L.	Timer	M.M.
"Ensign"	ER42/3	Upright	8.7	2	X	X	400W	—	X	—	X
"Ensign"	ER42/1R	Upright	8.7	2	X	X	400/800W	X	X	—	X
"Ensign"	ER44/1T	Elevated	8.3	2	X	X	—	—	X	—	X
"Commodore"	ER43/1AR	Upright	8.7	2	X	X	400/800W	X	X	X	—
"Commodore"	ER43/3ARF	Upright	8.7	2	X	X	400/800W	X	X	X	—
"Commodore"	ER44/1A	Elevated	8.3	2	X	X	—	—	X	X	—
"Commodore"	ER44/1AR	Elevated	8.3	2	X	X	400/800W	X	X	X	—
"Commodore"	ER44/1ARF	Elevated	8.3	2	X	X	400/800W	X	X	X	—

	42/1 42/1R	43/1AR 43/1ARF	44/1A 44/1T	44/1AR 44/1ARF	Servicing Information
RATING kW amps.	8.7 } 36.4 }	7/.036	8.3 } 34.7 }	7/.036	Rating Plate — Rear wall grill compartment.
TERMINAL — Amps. G.H.P. + 6½" H.P. A1 8" H.P. + Oven A2	16.7 } 19.7 }	1/.064	16.7 } 18.0 }	1/.064	Main Terminals — Lower right hand side at rear. Accessible by removing cover plate.

Control Panel — Remove back cover plate (three screws each side; two lower edge); this also releases fascia surround. Fascia and surround then hinge forward for access to controls.

Fascia Glass—To replace, remove surround (see above), pull off all control knobs, remove knurled nuts from toggle controls. Lift off glass.

Controls — Centre-bush mounting to metal sub-panel. Palnuts are accessible with a 7/16" tube spanner inserted inside palnut through access hole in glass.

Oven Timer—Smiths DDS0661/14. Vertical mounting, secured to sub-panel by three screws.

Minute Minder — Smiths five-hour mechanical, secured to sub-panel by two screws.

Rotisserie, O/L Controls — 3A. Arcoelectric. Black toggle.

Oven Selector, Grill-Hotplate Control — 15A. Benella toggle.

Control Switches — MH21 or Robertshaw 323.14.

Thermostat — Satchwell TO.37. Centre bush mounting.

Hotplates — Corox Plug-in (Mark III). 8" — 2100W. 6½" — 1600W.

Grill Hotplate — Corox Plug-in 2400W. 15" x 7½" two section. Lead out straight.

Fuses — Behind cover plate at rear of grill compartment.



New World Ensign ER42/3

Oven Light — 25W B.C. Twist clip to side, lift out glass.

T.O.E.: 42/1 only — 400 W. 9" W x 7½" + 2½" D. fixed, Corox. Remove screws in wallplate, draw element forward. In parallel with B.O.E., no selector.

Other Models—400/800W. 10-3/8" W x 8" + 3" D. fixed, Corox. Remove as above through selector. ER42/ER43 — selector limits O.E.s to 2.6kW — "Bake" T.O.E. inner (400W) and B.O.E. in parallel — "Grill" T.O.E. sections in parallel (1.2kW), B.O.E. off. ER44 — selector — "Bake" B.O.E. only (2.2kW) — "Grill" two section T.O.E. only (1.2kW).

Rotisserie — Eilbeck & Co. Remove three screws in plate securing rotisserie to oven rear, pull back plate.

B.O.E. — Corox, hinged — 2.2kW. 13" W x 13" + 1" D. Remove as for T.O.E.

Oven Door — Non-lift off. Springs accessible by removing either side panel (two screws front and rear).

Servicing The Electric Range

Malleys "Whirlpool" Chancellor Elevated Ranges

Model No.	kW	H.P.	Grill	T.O.E.	B.O.E.	Timer	Rotiss.
CE861AR	9.95	3	Sep. El.	850W	2000W	X	X
CE860T	7.75	2	15" x 7½"	—	2000W	1 hr. M.M.	—
CE860TR	8.60	2	15" x 7½"	850W	2000W	1 hr. M.M.	X

Controls—Centre bush. Access to nut through glass fascia. Control panel lifts off for access to controls and wiring. Remove two screws holding panel to range frame. Lift off locating pins, lay on hob. Pilot light—remove four screws holding mounting panel. Pilot light held by moulded wings.

Conduit Entry—Below main terminals.

Hob—Hinges up for access to socket blocks, etc. Pull hob forward, lift up, push back to lock in raised position.

Oven Door—Double glass window, lift off type. To remove, push wings over quadrants, close onto them, pull straight up.

Timer—Smiths DDS0661/6. Used on previous models. Held to mounting panel by four screws. Change face to new timer.

Minute Minder—1 hour mechanism. Held to plate by two screws. Plate held by four screws to mounting panel.

Grill Control—R/S 822.05. Used on previous models.

T.O.E. Control—R/S 553.05. Used on previous models.

Thermostat—R/S EA3A. Series switch on thermostat. Turns on one pilot light, other cycles with thermostat.

H.P. Controls—R/S 553.05. Used on previous models.

Pilot Light—All Lumolite FM2. Remove mounting panel for access.

Oven Light and Rotisserie Control—Arcoelectric toggle. Held to glass fascia by c.p. nut.

Rotisserie—Warner Drayton 27/14. Held by two screws to bracket on back of liner. Access from rear.

Oven Light—15 W.E.S. Access from oven. No glass over globe.

Fuses—20A. Federal A.C.I. Behind cover at back of grill compartment.

Hotplates—P.I. G.E.P. or Malleys 8" x 2050W; 6½" x 1250W.

Hotplate Socket Blocks—G.E.P.—two screws under hob. Wiring stand two screws. Malleys—screw into hob lip.

Main Terminals—Behind rear cover at back of hotplate section.

Grill Element Socket Blocks—See oven element socket blocks.

Grill Element—Double (3kW), two sections each with own pins and sockets on common backplate which fits into grill runners at front.

Grill H.P.—Malleys P.I. 15" x 7½". Two separate sections.

Grill H.P. Socket Blocks—Same as for Malleys Type H.P.'s.

Top Oven Element—850W P.I. Malleys. 8½" W x 6½" + 4½" D.

Bottom Oven Element—2kW P.I. Malleys. 14½" W x 12½" + 1½" D.

Oven Element Socket Blocks—Held to back of range by two screws. Access from rear.

Rating Plate—All models, on shelf at back of grill compartment. Access, pull hinged hob forward.



• Model CE861AR.

Servicing The Electric Range

Chef 'Consul' Upright Range.

		0454A	Servicing Information
RATING	kW Amps. Cable	7.95 33.15 7/.036	Rating Plate — On fuse cover at back of grill compartment.
TERMINALS			Main Terminals — Behind cover at rear of range. Conduit Entry — Below main terminals.
	8", 6½" H.P. Oven Light A1 Griller, Oven A2	3.375 4.6	

Controls — Centre-bush mounted to metal fascia. Access — remove switch knobs and top rear panel.

Oven Door — Lift-off type. Double glass window. To lift off, open to grill position, pull straight up.

Oven Vent — Through gap in gasket at top of door.

Pilot Light — Neon AMP. Held by speed nut to fascia. Access, remove back panel.

Thermostat — R/S EA3-469-42. Access, see above.

Griller Control — R/S 812-04. Divided control. Access, see above.

H.P. Controls — R/S 572-06. Access, see above.

Oven Light Control — 3A Arco-electric toggle.

Timer — Smith's 1 hour mech. Access — slide panel up, release from bottom channel, pull out from top.

Hotplates — 8" x 2100W. and 6½" x 1250W. P.I. Stokes.

Socket Block — Held by 2 screws to wiring channel fixed below hob. Access — pull into grill compartment

Reflectors — C.P. one-piece dress ring and reflector.

Griller H.P. — 2400W. 15" x 7½" Stokes P.I.

Socket Block — Same as for H.P. Socket blocks.

Oven Light — 25W. B.C. Fancy round. Remove 2 screws from light glass frame for access to globe.

Fuses — 1 x 15 amp. and 1 x 20 amp. Behind cover at rear of grill compartment.

B.O.E. — 2200W. Term. Conn. Stokes. 14½"W x 15½" + 1½"D. Held by 2 screws through wall plate.

Storage Drawer.



SECTION 2
ITEM N° 93

Servicing the Electric Range

Westinghouse PAJ Upright Ranges

Model	Model-No.	Rating	H.P.	G.B.	T.O.E.	B.O.E.	Timer	M.M.	Cook & Hold	Rotiss.	Thermal Eye
Cambridge	PAJ224GD	9.08kW	2	X	X	X	X	—	X	X	X
Cambridge	PAJ224	9.08kW	2	X	X	X	X	—	X	X	X
Grenville	PAJ223GD	9.0 kW	2	X	—	X	X	—	—	—	—
Grenville	PAJ223	9.0 kW	2	X	—	X	X	—	—	—	—
Trenton	PAJ221R	8.5 kW	2	X	X	X	—	5-hr	—	X	—
Bahama	PAJ221A	8.5 kW	2	X	—	X	X	—	—	—	—
Lisbon	PAJ221T	8.5 kW	2	X	—	X	—	1-hr	—	—	—
Durban	PAJ221	8.5 kW	2	X	—	X	—	—	—	—	—
Savoy	PAJ220	8.5 kW	2	X	—	X	—	—	—	—	—

Controls — Centre-bush mounted. Access to nut through glass fascia. **Thermostat** — Held to sub-panel by 2 screws. Access — remove sub-panel. To remove sub-panel remove 4 screws, 2 at each end, remove all switch knobs, pull panel out from rear.

Oven Door — Full glass with aluminium frame, lift off type. To lift off, open to grill position, pull straight up. Those model Nos. ending GD. glass door, other models double glass window.

Oven vent — Through top of oven into grill compartment.

Griller Control — 15A Microheat MH15 divided control. Mounted to sub-panel by centre-bush nut. Access, same as other hotplates.

8" H.P. Control — 15A Microheat MH11. Mounted to sub-panel by centre-bush nut. Access through glass fascia.

Hob Light — 60W strip light. Mounted on back panel of range. To remove light, loosen screws in nolder, remove tube.

Oven and Hob Light Controls — 3A Arcoelectric. Mounted to metal panel by knurled nut. Remove from rear.

Hotplate Selector Switch — 15A Bennell. Selects hotplate operation through timer or normal. Mounted to metal panel by knurled nut. Remove from rear.

Fuses — 20A Federal ACI. Behind removable cover at rear of grill compartment.

10% Input — 15A Microheat MH10. Controls oven during cook and hold. Mounted to bracket next to main terminals. Access, remove lower rear cover.

T.O.E. — 900W 7½"W x 12½" + ¾"D. Held by 2 screws into oven liner. Pull into oven, disconnect.

B.O.E. — 2100W 13½"W x 13" + 1"D. Held by 2 screws into oven liner. Pull into oven, disconnect.

6½" H.P. Control — Teddington TBK Thermal Eye. Mounted to sub-panel by centre-bush nut. Access, same as other hotplates.

Oven Thermostat — Wilcolater GIAT-101. Mounted to sub-panel by 2 screws. Access, remove sub-panel.

Oven Light — 40W E.S. Remove light glass for access. To remove glass, turn clips holding glass. Lift out.

Selector Switch — 20A GW. 3034. Mounted to sub-panel by centre-bush nut. Access, same as hotplate switches. Selects Preheat, Bake or Rotisserie.

Timer — DDS0865/2. Remove knobs, remove 4 screws, pull out from back.

Minute Minder — 5-hr. or 1-hr. mech. fitted some models. Held to sub-panel by 2 screws. Access, remove sub-panel. See above.

Pilot Lights — 3A Arcoelectric. Held to sub-panel by speed nut. Access, remove sub-panel.

Hotplates — 8" x 2600W and 6½" x 1600W. New type P.I., flat vertical pins. Reflector, one piece with ring.

Socket Blocks — Remove 2 screws from securing plate. Pull block into grill compartment.

Rotisserie — Eilbeck & Co. Mounted to bracket by 4 screws. Bracket mounted to oven liner by 3 screws. Access, remove screws from back of oven liner. Remove unit from rear.

Griller H.P. — 2700W P.I. socket block. Held by 2 screws into hob.

Rating Plate — L.H.S. of grill compartment toward front.



• Westinghouse Bahama

Roast Probe — Transformer, 240V to 12V, and buzzer mounted on rear of range. Cover over transformer held by 2 screws.
— Jack fitted to top of oven liner.
— Bi-metal type probe. Set dial on probe to desired temperature.

Servicing The Electric Range

Malleys Whirlpool "Chancellor" Elevated Ranges

Model	kW	H.P.	G.H.P.	B.O.E.	T.O.E.	Timer	M.M.	O/Lt.	Rotiss.
CE53/7	7.7	2	X	X	—	—	X	X	—
CE54/7	7.7	2	X	X	—	X	—	X	—
CE55/7	8.55	2	X	X	X	X	—	X	X

		CE53/7 CE54/7	CE55/7	Servicing Information
RATING —	kW amps Cable	7.7 32.0 7/.036	8.55 35.6 7/.036	Rating Plate — Draw hob forward. Plate mounted left hand side on top of rear member grill compartment.
TERMINALS —	Cable	1/.064	1/.064	Main Terminals — Behind cover rear of hotplate section.
A1 — 8" H.P. + G.H.P.	kW amps	4.45 18.5	4.45 18.5	
A2 — 6½" H.P. + Oven	kW amps	3.25 13.5	4.10 17.1	Conduit Entry — Below main terminals.

Hob—Hinged at rear for cleaning and servicing. Method—Pull grill drawer out about 4". Hold hob at front, draw forward, raise at front, then push to rear with hob in raised position. Hob is then locked in raised position. Reverse procedure to lower.

Controls — Centre bush mounted to metal sub-panel behind glass fascia. Accessible without moving range. Remove 2 hex. screws in top surround. Lift complete fascia panel off back cover plate and lay forward. Access. Pilot Lights—pull off all knobs, remove 4 screws in sub-panel corners, ease back.

Oven Door — Lift-off type. Turn hinge tabs to lift position, allow door to close on to tabs, close a little further, lift off quadrants.

Springs—Inside oven door, inaccessible.

Timer — CE55/7 and CE54/7 models only. Smith's DDS0661/6. Secured to sub-panel by 4 screws.

Minute Minder — CE53/7 model only. Smith's one-hour ringer. Secured to sub-panel.

Thermostat P/L. — Lumolite FP9. Secured by speed nut to sub-panel.

Thermostat—R/shaw EA3. Centre bush mounting.

Oven Light & Rotisserie Controls —3A. Arcoelectric toggle. Secured to glass fascia.

Hotplates — GEP plug-in. 8" × 2050W. Cat. 2249. 6½" × 1250W. Cat. 2248. Reflectors — V.E. Mounting ring.

Socket Block—Remove coil, ring and reflector. Through hob opening, remove socket block screws.

Grill H.P. — 2.4kW 15" × 7½" GEP hinged. Raise at front, remove loose dress ring. Pull out 2 U-shaped hinge pins, lower into grill compartment, disconnect.

T.O.E. and Hotplate Controls — R/shaw 552-05. Replacement R/shaw 323-14. Access, as above.

Grill Hotplate Control — R/shaw 822-05. Access, as above.

Rotisserie — Warner Drayton. Secured by 2 screws to bracket rear of range.

T.O.E.—850W. 8"W × 6½" + 3½"D. On CE55/7 model only. Removal same as for B.O.E.

B.O.E.—2.0kW. 14½"W × 13½" + 1" D. Q.C. Hinged. Remove wallplate screw, lift so wallplate bottom lugs clear wall hole. Lift element front, draw plate down and out.



Servicing The Electric Range

Malleys Whirlpool "Premier" and "Statesman" Upright Ranges

Model	kW	H.P.	G.H.P.	BOE kW	TOE	Timer	M.M.	O/Lt.	Rot.	Roast Sentry	Warm. Drawer	Hob Lt.	Memory Lts.
Statesman SE13/7	7.9	2	15" x 7½"	2.0	—	—	X	X	—	—	X	—	X
Statesman SE14/7	7.9	2	X	2.0	—	X	—	X	—	—	X	—	X
Statesman SE15/7	8.75	2	X	2.0	850W	X	—	X	X	—	X	—	X
Premier PE33/7	8.2	2	X	2.5	—	—	X	X	—	—	—	—	X
Premier PE35/7	9.4	2	X	2.5	1kW	X	—	X	X	—	X	X	X
Premier PE36/7	9.4	2	X	2.5 PI	1kW PI	X	—	X	X	X	X	X	X

	SE13/7 SE14/7	SE15/7	PE33/7	PE35/7 PE36/7	Servicing Information	
RATING	kW amps Cable	7.9 32.8 7/.036	8.75 36.3 7/.036	8.2 34.1 7/.036	9.4 39.1 7/.036	Rating Plate —Back left hand side of grill compartment.
TERMINALS —Amps. A1 A2 Cable	14.3 18.5 1/.064	17.8 18.5 1/.064	15.6 18.5 1/.064	19.8 19.3 1/.064	Main Terminals —Behind top rear cover. Connection direct to fuses. Conduit Entry —Bottom of top rear cover.	

Controls—Centre bush mounted to sub-panel. Nuts accessible through glass fascia without moving range. Remove 2 hex. screws top of panel. Lift panel and lay forward. To remove sub-panel for access to pilot lights and minute minder, pull off all knobs, remove screws in corners of sub-panel, ease back.

Oven Door—Lift off type. Method of removal—(a) Swing hinge tabs to lift position. (b) Allow door to fully close on tabs. (c) Close door a little further. (d) Lift door straight up and out.

Grill H.P. Control—R'shaw 822-05.

T.O.E., 8" & 6½" H.P. Controls—R'shaw 552-05.

Thermostat—Robertshaw EA3.A Centre bush. Change front and selector to Van EA3.

Roast Probe—King Seeley. Remote indicator. Access as for CONTROLS.

Timer—Smith's DDS0661/6. Secured to control sub-panel by 4 screws, draw back and disconnect.

Minute Minder—Smith's 5-hour. Securing screws behind glass, necessary to remove sub-panel.

Warming Drawer, Oven Pilot Lights—Lumolite square face, necessary to remove sub-panel.

Accessory Controls—3A. Arcoelectric black toggle. Knurled nut to glass fascia.

Hotplates—Chrom. P.I. H.M. 8" x 2050W. Cat. 2249; 6½" x 1250W. Cat. 2248.

Reflectors—Chrom. V.E.

Socket Block—Remove coil, ring and reflector. Through hob opening, remove socket block screws.

Mounting Ring—Break or cut off turn-over clips.

Grill H.P.—2.4 kW 15" x 7½" T.C. H.M. Hinged from hob. Raise at front, remove loose dress ring, pull out U-shape hinge pins, lower into grill compartment, disconnect.

Fuses—Federal 20A. AC1—Remove cover rear of grill compartment.

T.O.E., Statesman—850W. 8"W x 6½" + 3½"D. Q.C. Hinged. **Premier**—1 kW. 8½"W x 6½" + 4½"D. Hinged 35/7. P.I. 36/7. Term. conn.—See B.O.E. below for removal.

Socket Block—Secured by 2 screws, draw forward, disconnect.

Oven Light—15W. E.S. Turn clips to side, remove glass.

Rotisserie—Warner Drayton 27/14. Secured by 2 screws at rear. Remove lower rear cover.

B.O.E., Statesman—2.0 kW. 14½"W x 13½" + 1"D. Q.C. Hinged. **Premier**—2.5 kW. 17½"W x 13½" + 1½"D. Q.C. Hinged 33/7, 35/7. P.I. 36/7. Term. Conn. **B.O.E.**—Remove wallplate screw, lift so wallplate bottom lugs clear wall holes, lift element front, draw plate down and out.

T.O.E.—As B.O.E., but all movements down.

Socket Block—Secured by 2 screws, draw forward, disconnect.

Warming Drawer—200W. 8½"W x 7" + 4½"D. Q.C. Fixed. Remove screws in wallplate, pull element forward, disconnect.

Indicator (Memory) Lights—Lumolite FM2. Secured by side fins to control sub-panel, necessary to remove sub-panel.

Hob Light—13W. Fluorescent 21" tube. Clipped to top of control sub-panel. Ballast and starter secured to control sub-panel.



Servicing The Electric Range

Simpson "Belmont" and "Ambassador" Ranges

		H.P.	G.H.P.	B.O.E.	T.O.E.	Timer	O/Light	Rotiss.
MODEL —Belmont	—61-188	2	15" x 7½"	2.2kW	500W	X	X	X
—Ambassador	—61-189	2	15" x 7½"	2.6kW	500W	X	X	X

	BELMONT 61-188	AMBASSADOR 61-189	Servicing Information
RATING kW amps.	8.49 } 35.4 }	7/.036	Rating Plate — Front of grill compartment floor.
TERMINAL — Amps. 8" H.P. + G.H.P. A1 6½" H.P. + Oven A2	18.8 } 16.6 }	1/.064	Access — Remove small cover from rear panel top.

Controls — Rear panel not removable. Centre bush mounting on sub-panel held by screws behind glass. Remove side screws holding fascia surround, lift surround up and off, remove control and timer knobs, lay glass panel forward. Timer mounted on brackets off back panel.

Hotplate Sockets — Access through hob opening, remove 2 screws securing porcelain block to bracket. Pull block forward and disconnect.

Grill Height Adjustment — Sliding knob on right hand side of tray raises or lowers pan to any desired height.

Griddle Plate — "Teflon" coated cast griddle plate supplied as standard equipment.

Oven Door — Lift off. Insert keys in quadrants, partially close door and lift off. Springs inside oven door, inaccessible.

H.P. Controls — Robertshaw 572.05. Replace with 323.09.

Grill H.P. Control — Robertshaw 822.05 Divided.

T.O.E., Rotisserie, Oven Light Controls — 3A. Arcoelectric black toggle. Secured to glass panel by knurled nut.

Thermostat — Robertshaw EA3. Screws through spurt holes, pack back with ¼" nuts.

Pilot Light — Carr Fastener. Cat. 180273. Clips into slot in sub-panel.

Timer — Smith's DDS0665/4 Mech. and Face. Remove 4 hexagonal screws securing timer to brackets at front. To realign, loosen 4 bracket screws back of rear panel and move complete mounting.

Hotplates — Stokes P.I. One piece C.P. mild steel bowl and surround.

8" x 2100W. Cat. 2052
6½" x 1250W. Cat. 2050
6½" x 1500W. Cat. 2051
8" x 2100W. Cat. 2052

Grill Hotplate — Stokes 15"x7½". 2.4kW. Cat. 478 Q.C. Hinged. Remove 2 screws securing shield to hob and 2 split pins in hinge tongues. Pull hotplate forward until tongue clears hob turn down. Lower in grill compartment and disconnect.

Fuses — 20A. Federal. Rear of grill compartment.

T.O.E. — 500W. Stokes Q.C. Cat. 1079. Fixed. 9"W x 7½" + 4½"D. Not through thermo. Toggle control. Remove screws in wallplate, pull forward and disconnect. Ele-

ment used for browning and rotisserie cooking only.

Oven Light — 25W. E.S. Prise out glass cover, unscrew lamp.

Rotisserie — Warner Drayton 27/21. Through timer. Secured by 4 screws at rear.

B.O.E. — 2.2kW. Stokes Q.C. Cat. 1087. 14"W x 13½" + 1"D.

B.O.E. — 2.6kW. Stokes Q.C. Cat. 1088. 16½"W x 13½" + 1"D.

Access — Remove 2 screws in wallplate, pull element forward and disconnect.



● Simpson Belmont

Servicing The Electric Range

Metters LD2 Upright and ED1, ED2 Elevated Ranges

	Type	kW	H.P.	Grill.	B.O.E.	T.O.E.	Rotiss.	O/L.	Hob L.	Timer	M.M.	Th. Eye
LD2	UP	10.875	4	X	X	X	X	X	X	X	—	X
ED1	EI	10.8	4	X	X	X	—	X	—	—	X	—
ED2	EI	10.875	4	X	X	X	X	X	X	X	—	X

Rating	kW amps. Cable	LD2 ED2	ED1	Servicing Information
		10.875 45.3 7/.036	10.8 45 7/.036	Rating Plate: Upright—Behind oven door —Access, lift off door. Elevated—Bottom of grill compartment.
Terminals B.O.E., T.O.E., 6½" H.P., Rotiss., O/L. 6½" H.P., 8" H.P., Hob Light Grill 6½" H.P.	A1 A2 A3	4.3 3.325 3.25	4.25 3.25 3.25	Main Terminals —Back of range below switch panel. Remove rear cover. Conduit Entry —Below main terminals.

Controls—Centre bush mounting to metal sub-panel. Nuts accessible through hole in glass fascia. Simmer—4 term P.V. Thermal Eye—Slip bulb out of spring, remove fume guard rear of range, pull through capillary. Pilot Lights—Secured to sub-panel by speed nuts.

Oven Door—Lift-off type, double glass. To lift off, close to "grill" position and pull up. Springs accessible by tilting range back. On upright pull out storage drawer to limit.

Oven Vent—Through gaps in oven door gasket at top.

Hob Light—8W fluor. Mounted on removable strip at top of back cover.

T.O.E. Control—Proctor PV185—Replace with PV107. See above.

Timer—Smiths DDS0665/1—Mech. only. Secured to sub-panel by 4 screws at rear. To change timer, pull off hands, plug-off face, and change to new timer.

Thermal Eye—Teddington Type TBK.

Hotplate Controls—8" PV186—Replace with PV110, 6½" PV185—Replace with PV107. See above.

Grill Control—Proctor PV184—Replace with PV110. See above.

Thermostat—Wilcolator G1-145. Replace with EA3.

Hob, O/L. and Rotiss. Control—3A Arcoelectric secured by nut beneath fascia.

Hotplates—8" x 2050W., 6½" x 1250W. GEP. P.I.

Socket Block—Access, plug out grill element and V.E. cover.

Front plates—Remove screws in metal covers, draw block forward.

Back plates—Remove screws in V.E. panel beneath H.P., slide forward. Remove screws in block.

Elevated—Small socket required to get out screws, V.E. panel fixed.

Fuses—20 A.S.E.—Rear of grill compartment. Access, plug out grill element.

Grill Element—2500W. 13½" x 9½" x 2½" GEP. P.I. Separate reflector.

Socket Block—Remove 2 screws at rear, pull forward.

T.O.E.—1200W. 12½" x 4½" x 7½" GEP. P.I.

Socket Block—Same as for grill element.

Rotisserie—(Ellbeck & Co.) Secured by 4 screws through oven.

Change coupling to new rotiss.

B.O.E.—1800W. 15½" x 12½" x 1½" GEP. P.I.

Socket Block—Same as for grill element.

Oven Door—Lift-off type. See above.



• Metters LD2

Servicing The Electric Range

G.E.C. "Mastermatic" Range (Thermostatic Hotplate Control)

	kW		2 H.P.	G.H.P.	Timer	T.O.E.	B.O.E.	Hob, O.L.	Rotiss.
DCA663ER	7.9	Elevated	X	15"x7½"	X	X	X	X	X
DCA663EA	7.9	X	X	X	X	X	X	X	—
DCA663A	7.9	Upright	X	X	X	X	X	X	—
DCA663AR	7.9	X	X	X	X	X	X	X	X

Thermostat (Thermal Eye) control on 6½" hotplate only — all models.

Rating	kW amps.	7.9 32.8 7/.036	Rating Plate —Located front left hand side of grill compartment.
Terminals	A1 A2 Cable	4.5 kW 18.7 amps. 3.4 kW 14.1 amps. 1/.064	Main Terminals —Remove top rear cover. Conduit Entry —Bottom centre of top rear cover.

Hob—Hinged at rear. Locked down at front with bracket both sides of grill compartment. To raise, loosen screws and turn bracket. Raise hob at front and prop open. No support provided.

Common Terminal Box—All hotplate connections inside box fixed to hob. **Access**—Raise hob, remove 4 screws in cover—see "Hostess" depot sheet.

Controls—Mounted on metal sub-panel behind glass. **Access**—Pull off knob, securing screws or centre bush nut accessible through hole in glass.

Fascia—Glass face held by surround which is secured by 2 screws on each side. **Elevated**

Models — Access to oven side screws by detaching splashback, which is held by 4 nuts at bottom behind rear cover, and pushing oven side corner back.

Oven Thermo.—Robertshaw EA3

CB 2 screw mounting with selector. See T.O.E. for details.

Accessory Switches—3A. Arcoelectric, Black toggle, secured by knurled nut to glass panel.

Timer—Robertshaw Lux (Chamberlain & Hookam). Pull off timer knobs, remove 4 screws at rear, pull back.

Hotplates—8"x2100W., 6½"x1250W. Corox Mark 3. Plug-in. Socket block secured to a common terminal box by 2 screws.

Grill-Hotplate—15" x 7½", 2400W. 2 section hinged. Secured to common terminal box by 2 screws.

Top Oven Element—450/1700W. 12"W x 10½" x 2½"D. Hinged. Remove 2 screws in wallplate, pull forward and disconnect. Outer 450W. section in parallel with B.O.E. (Bake). Inner 1700W. section cycles on thermo. from "Grill" back to 200°F. (Oven Grill or Rotisserie.)

(Continued Overleaf)



• G.E.C. Mastermatic DCA663AR

ITEM NO. 98 (CONT'D)

2.

SERVICING THE ELECTRIC RANGE

Oven Light - 15W. E.S. Remove screw and clip, slide glass to side, unscrew lamp.

Rotisserie - Warner Drayton 27/14. Remove 4 screws securing Rotisserie to back of oven.

Bottom Oven Element - 1700W., 14"W x 13 $\frac{1}{4}$ " x 1 $\frac{1}{4}$ "D. Hinged. Remove 2 screws in wallplate, pull forward and disconnect. Fit van Email tubular.

Oven Door - Non lift off, drop type. Double glass window.

Springs - Both sides of storage compartment.

Hob Light - 15W. Fluorescent. Place thumbs on bottom of tube as far under as possible. Place hands on top of splashback, push with thumbs, roll tube to release from sockets.

G.H.P. Control - Robertshaw 823.03. Divided. Centre bush mounted.

8" H.P. Control - Robertshaw 543.02. Centre bush mounted. Fit LH 323.09.

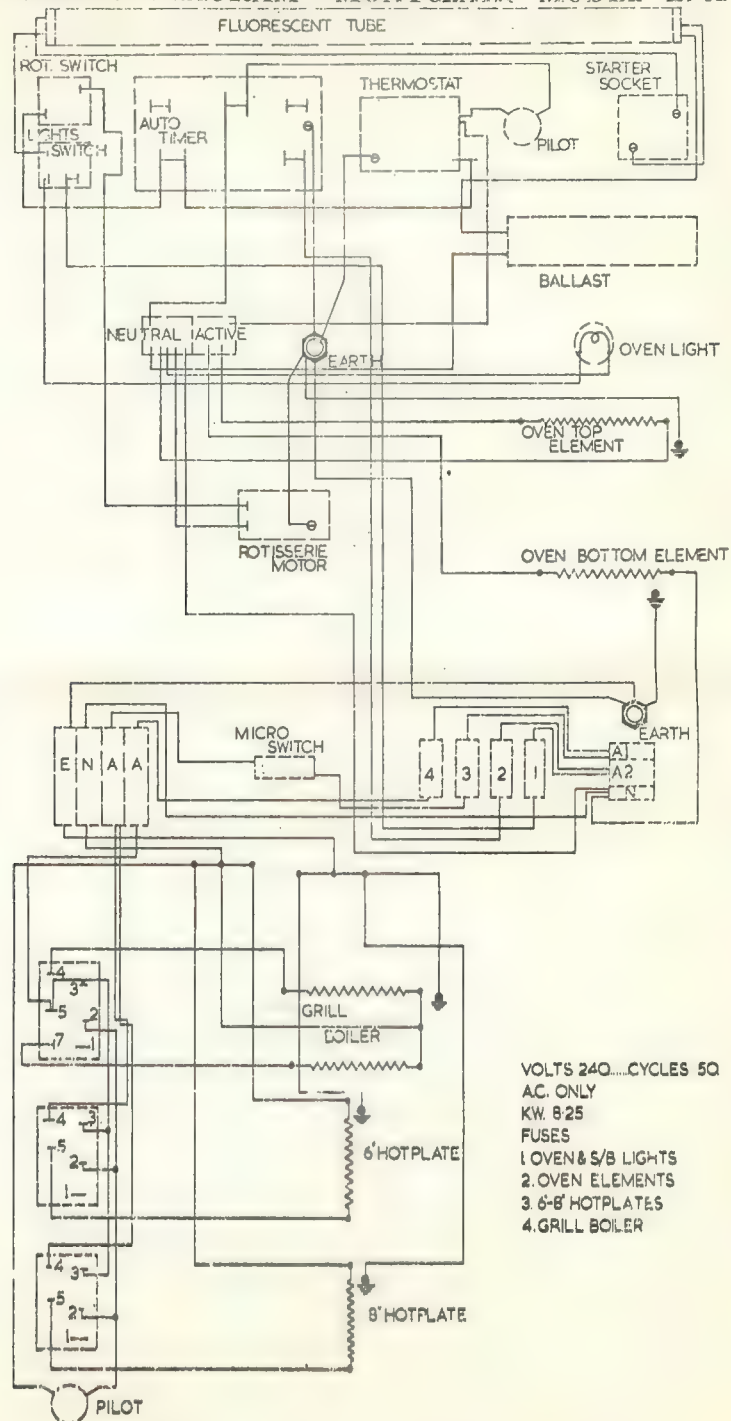
Neon Indicators - Robertshaw with leads. Secured over respective control with saddle.

6 $\frac{1}{4}$ " H.P. Control (Thermal Eye) - Robertshaw HB2-70-36. Through timer for auto. control. Remove coil and reflector, raise hob. Remove bracket supporting thermo. bulb, loosen off grub screw and pull out bulb through rear of range. Secured to sub-panel by 2 screws behind glass fascia. Necessary to remove fascia and chrome surround.

Fuses - Federal 20 amp. ACI. Remove 2 knurled head screws in cover.

SECTION 2
ITEM N° 99

WIRING DIAGRAM—MONTCLAIR MODEL E9A



Servicing The Electric Range

CHEF WALL OVEN
JULY, 1973

Model:

Imperial EWO2BAR, 2 ovens.

Rating:

4.43 kW, amps. 18.9.

Terminals:

Lower Oven, Lights:
A1 9.28 amp.

Upper Oven Rotiss.:
A2 9.12 amp.

Main Terminals:

Located behind cover at rear.

Fuses:

15A Federal A.C. 1. Located behind top cover strip above glass.

Oven Lower:

B.O.E.: 2,200 W Stokes 1292.
Held to back of oven by 2 screws.

T.O.E.: 1,500 W Stokes 1293.
Held to back of oven by 2 screws.

Thermostat: Robertshaw EA3 CB-484-42.

Pilot Lamp: Lumolite. Held to sub-panel by speed nut, access see below.

Oven Upper:

B.O.E.: 2,200 W Stokes 1292.
Held to back of oven by 2 screws.

Thermostat: Robertshaw EA-3469-42.

Pilot Lamp: Lumolite. Held to sub-panel by speed nut, access see below.

Timer:

G.E. 3 AST 19-118-188. Held by 2 screws into sub-panel.

Oven Lights:

15 W E.S. pilot — remove wire guard for access.

Control Arcoelectric 3A black toggle.

Controls Access:

Remove trim top and bottom of glass, chrome plated nuts holding toggle switches, and 4 screws holding sub-panel. Pull forward for access to controls.

◆ Chef Imperial Wall Oven, Model EWO 2 BAR, 2 ovens.



Servicing The Electric Range

METTERS
(Debonair Programmer)
October, 1973

Models:

LD14A — LD14AR.
Upright. 4HP., Grill, T.O.E.,
B.O.E., Rotisserie., Timer.

Rating:

11.26 kW 46.9 Amps.

Terminals:

A1 — T.O.E., B.O.E. Rotisserie
3.40 kW 14.15 Amps. A2 — Grill.
L/F HP. Oven & hob light 3.31
kW 13.8 Amps. A3 — L/R, R/R,
R/F, HPs. 4.55 kW 18.9 Amps.

Main Terminals:

Rear of range. Access by re-
moving inspection cover.

Conduit Entry:

Centre rear cover panel.

Fuses:

20A Federal FPC3 incorporated
with main terminal block.

Hotplates:

G.E.P. plug-in 6¼" — 1250 W
type 2248, 6¼" — 1250 W for
thermal eye. Type 2248G7 8" —
2050 W type 2249.
Controls — Aust. control 6¼"
type KV172-1320 W, 8" type
KV174-2070 W. Held to sub panel
by nut. Remove knob for access.
Socket Block: Held to under hob
bracket by 2 screws.

Grill:

G.E.P. plug-in 2 section 2000 W
type 9090G1 13½" x 9¼" + 5".
Socket Block: Secured rear grill
comp. panel by 2 screws.

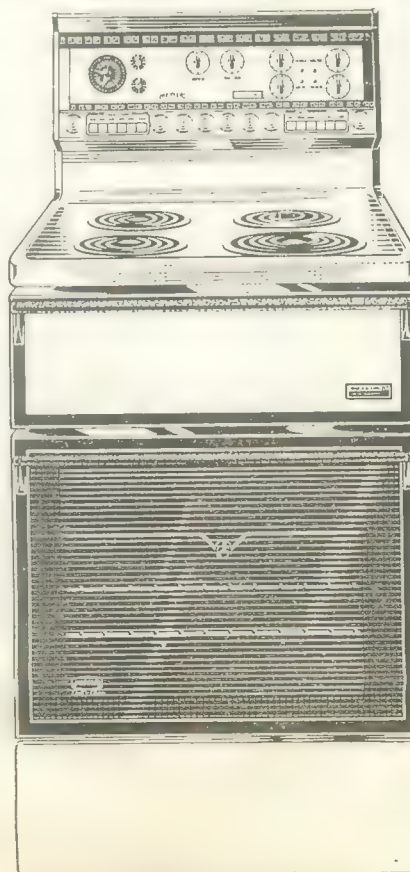
Control — Robertshaw 323.07.
Centre bush mounting to sub
panel.

Selector — G.W. 6 push button
switch type 2996E18.

Oven:

T.O.E. G.E.P. Plug-in 91001
1000 W. 11¾" x 5½" + 6".
B.O.E. G.E.P. Plug-in 90792
2400 W. 18" x 15" + 1¼".

♦ Metters Debonair — LD14AR Range.



Control: T.O.E. — KV175: 981-
1150 W-preset. Cycling 25%.

Keep warm — Robertshaw
720.07. Preset 20%. In conjunc-
tion with thermostat.

Selector: 6 Push Button GW
2996J6.

Thermostat:

Wilcolator GIAT-104. Range 150
— 550°. Centre boss mounting.

Pilot Lamps:

Telite 240V Q/C terminals.

Rotisserie:

A-Vago — Milano AV311. Fixing
2 screws into back panel.
Control — By oven selector
switch.

Timer:

GE3AST19-118-199. Held to sub-
plate by 4 screws. Remove sub-
plate and timer complete.

Oven Light:

25 W E.S. G.E.C.

Hob Light:

13 W Bipin fluorescent, 36.5 cm
x 1.25 cm.
Starter — Thorne PGU. Ballast
— Natronic Fineline FL18.
Control — Incorporated in grill
selector push button switch.

Oven Door:

Full glass. Lift off type.

Oven Liner:

Self clean wipe off. Cleaning
temperature. 500° for 1 hour
each 2 weeks. ♦ ♦ ♦

Servicing The Electric Range

METTERS DEBONAIR WALL OVEN (Programmer Series) November, 1973

Models:

WD134 ARB—T.O.E., B.O.E.,
Grill, Rotisserie, Timer

WD136 ARCC—Main T.O.E.,
B.O.E., Grill, Auxiliary Oven,
Rotisserie, Timer.

Rating:

WD134 5.45 kW 22.7A.

WD136 6.77 kW 28.2A.

Terminals:

WD134 A1 22.7A.

WD136 A1 28.2A.

Conduit Entry:

L/H rear.

Fuses:

WD134—FPC2—20A Federal. Unit
combined with terminal block.
Access rear of grill compart-
ment.

WD136—2 x 20A S.E. Access un-
der removable trim below
auxiliary oven door.

Main Oven:

T.O.E.—Grimwood 91001-1000 W
Plug-in $11\frac{3}{4}'' \times 5\frac{1}{2}'' + 6''$.

Control—Aust. control KV175
980-1150W. Preset 25% cyc-
ling.

B.O.E.—Grimwood 90792 2400

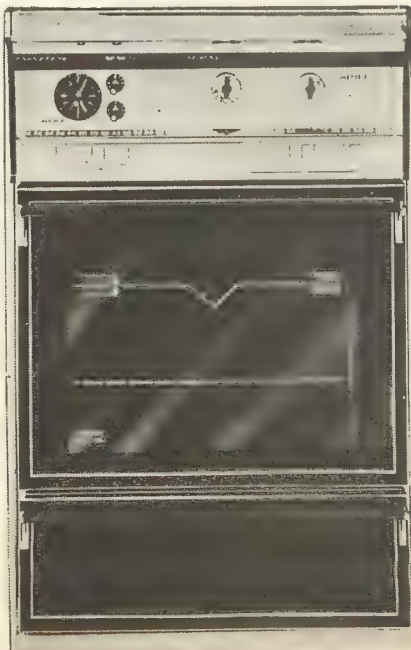
W Plug-in $18'' W \times 15'' +$
 $1\frac{1}{4}''$.

Keep warm control. Preset Rob-
ertshaw 720.07 25%. In con-
junction with thermostat.

Socket Blocks—Porcelain 2 pin
No. 28.131.427. Secured 2
screws.

Programme Selector—GW 2996-
J6.6 push button.

◆ Metters WD 134 ARB Single Wall
Oven.



Thermostat:

Main—Wilcolator GIAT - 104
Range 150° - 550° .

Auxiliary Oven (WD136ARC only)
Wilcolator G1-209. 150° - 550° .

Grill:

Grimwood 9090G1 2 section
plug-in 2.0 kW.

Control—Robertshaw 323.07.

Selector—GW 2996E18 6 push
button.

Socket block—2 Section No. 28.
135.427.

Rotisserie:

A—Vago - Milano - AV311. Con-
trolled by programme switch.

Timer:

GE 3AST19-118-199.

Oven selector (WD136AR only)
Rotary 3 position GW15-4256-
F2.

Oven Lights:

25W E.S. Control incorporated
with grill switch bank.

Pilots:

Telite 240V 0.3W.

Oven Liners:

Self clean wipe off V.E. Heat to
 500° F for 1 hour.

◆◆◆

EE - SO/BW/RPH
Ext. 4423

SYSTEM OPERATION BRANCH

10th November, 1977.

To: All Holders of Em.S O's Handbooks

Em.S O's Handbook

Attached is a revised edition of Section 3 complete;
Storage Water Heaters. Please insert these pages in Section 3 and
destroy all previous information.


ENGINEER - EMERGENCY SERVICE

Attach./

SECTION NO. 3

STORAGE WATER HEATERS

ITEM NO

1. General
2. Electricity Rates
3. Electricity Supply to Storage Water Heaters
4. Handling of Requests for Service to Storage Water Heaters
5. Reading of Meters on Electric Storage Water Heaters
6. Provision of Electric Supply to Current and Obsolete Rate Off Peak Storage Water Heaters After Repairs.
7. Cutting-In Time Switches on Rate "A" Installations Which Involve Considerable Load
8. Intermittent Faults in Rate "A" Installations
9. Time Switches - Correcting For Time
10. Time Switches Stopped in "On" Position
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SECTION NO. 3

STORAGE WATER HEATERS

ITEM NO. 1 - GENERAL

Electric storage water heaters giving a full hot water service are available in several types. Most of those met with on the Council's system are:-

1. Displacement type
2. Falling Level type
3. Run-Off type

Reference is made to each type in this section.

All makes of storage water heaters will be serviced by the Customer Service Section of the Metering Services Branch subject to conditions outlined in Section No. 1 of this Handbook.

Non-Council sales of storage water heaters are serviced by the respective manufacturers during the guarantee period of 12 months. If repairs are carried out by S.C.C. a charge will be made.

Most well known makes of storage water heaters are sold by The Sydney County Council.

ITEM NO. 2 - ELECTRICITY RATES

The Council supplies electricity for storage water heating at the following rates:-

1. Storage Water Heating Rate "A" (Off-Peak) (Now obsolete)

Supply restricted to hours determined from time to time by General Manager.

Maximum loading of element 60W per gallon (prior to 2.1.1969).

Capacity of heater not less than 35 gallons.

Time switch or other control supplied and fixed by Council.

2. Storage Water Heating Rate "B" (Continuous)

Maximum loading of element 60W per gallon.

A heating element on Rate "B" cannot be used in a heater which has an element supplied at Rate "A".

3. Booster Elements

Where heaters are supplied with a second heating (booster) element for occasional use, the electricity used by such an element is charged for at the rate applicable to the customer's installation generally on heaters connected prior to 2.1.1969.

ITEM NO. 3 - ELECTRICITY SUPPLY TO STORAGE WATER HEATERS

If the aggregate rating of all "Off-Peak" storage water heaters connected in an installation do not exceed 20 amps. (4.8 kW), but does not exceed 40 amps. (9.6 kW), they must be balanced over two phases and neutral.

ITEM NO. 4 - HANDLING OF REQUESTS FOR SERVICE TO STORAGE WATER HEATERS

All requests for service to storage water heaters shall, in the first instance, be dealt with by the Emergency Service Section unless it is obvious that attention is required by the Customer Service Section, for example:-

Tank leaking;
Tap dripping;
Inquiries re work or repairs carried out,
or to be carried out, by the Customer Service Section.

ITEM NO. 5 - READING OF METERS ON ELECTRIC STORAGE WATER HEATERS

The meters connected for electric storage water heaters will be read during each visit to the premises of customers complaining of excessive account, insufficient hot water, water overflowing, water boiling, or any other cause requiring an investigation by the Customer Service Section.

The cause of dissatisfaction, together with the serial number of the meter and its reading, will be entered on Daily Run Sheet and return code applicable to radio telephonist. This information will be forwarded to the Customer Service Section.

It frequently happens during the winter period that customers complain of inadequate supply of hot water. This, not uncommonly, is due to the capacity of the reservoir being inadequate for the hot water needs in winter months, and particularly on washing days, of the present occupant.

As the energy consumed in kilowatt-hours is proportionate to the consumption of hot water, the Appliance Repair Section may require further meter readings as a check of the operation of the storage water heater and to tender further advice to the customer, possibly by letter. Therefore, any further meter readings will be obtained by the System Operation Branch as required by the Customer Service Section.

ITEM NO. 6 - PROVISION OF ELECTRIC SUPPLY TO CURRENT AND OBSOLETE RATE OFF PEAK STORAGE WATER HEATERS AFTER REPAIRS

Emergency Service Officers may provide electric supply to Rate "A" Off Peak and Extended Off Peak heaters current or obsolete rates at other times than during the standard heating period, subject to the following:-

(See also Item No. 7)

1. When Cause of Failure Causing Insufficient Hot Water is Considered to be Due to Failure of S.C.C. Equipment.

(a) Defective Time Switch

Change time switch and cut in by manually operating the time switch to correct supply, provided an "off" operating lever is not so placed that it will disconnect the supply before hot water is available.

(b) Bridging the Time Switch

Bridge the time switch when an "Off" is so placed that it would prematurely disconnect supply if the time switch were operated manually, or if it is a time switch of a type not normally carried by Emergency Service Officers.

In the case of (b), Emergency Service Officers will report the action of bridging to the Radio Telephonist who will follow up to arrange for removal of bridge as soon as convenient or code back 6(b) U for replacement of time switch.

(c) Rhythmatic & Zellweger Controls

Bridge relay to make supply available to Off Peak heater. If relay is defective, bridge and return code 6(i) N to Radio Telephonist.

2. Additional Temporary Supply (Emergency Conditions Only)

Where an emergency arises, the Emergency Service Officer shall, from the field, contact the Despatch Officer Co-ordinator who will contact the relevant officer of the Electricity Development Branch or, after normal office hours, the System Operator who may arrange for the control equipment of Stored Heat Rate load to be temporarily bridged to provide additional hot water for a period of up to seven (7) days without affecting the Rate at which the storage water heater is normally supplied. Types of cases which would be considered as constituting an emergency are as follows:-

- (a) Where the care of an ill person temporarily requires the use of abnormal quantities of hot water.
- (b) An unanticipated temporary increase in the number of occupants in a household causing shortage of hot water.
- (c) A breakdown in a portion of the storage water heating installation, where the outcome is an inadequate supply of hot water seriously inconveniencing the customer, unless temporary supply of hot water is obtained from remaining storage water heating installation.

However, a shortage of hot water due to normal load growth or to an unsatisfactory type of hot water installation, or where additional hot water is required for a social activity or the like, cannot be considered as an emergency condition.

Note: If the element rating is 3.6 kW or above, the customer shall be advised to restrict the use of other household appliances during the period of emergency to ensure that no damage is likely to occur to installation from overloading. Officers of the Electricity Development Branch and officers of the Electrical Installation Branch will also provide this service as instructed.

In all instances where the temporary bridging of control equipment has been carried out, advice must be forwarded to the Technical Officer - Building Industry Liaison and Advisory Sub-Section so that the matter may be followed up to ensure the bridge is removed, and if the customer requires the supply to continue, that steps are taken to implement a change of rate. This information shall be recorded on an Emergency Service Request card and the card shall be forwarded to the Electricity Development Branch/Advisory Section.

3. Normal Service Call

Should an officer of the Emergency Service Section, when making a routine call at a customer's premises, notice that the customer has a storage water heater connected at Rate "B" (obsolete) or at the Domestic Rates, he will report this fact on his Field Run Sheet stating the capacity and rating of the heater.

A message cross-X will be placed on the Daily Run Sheet to draw the attention of the Despatch Officer Co-ordination for reference to the Technical Officer Building Industry Liaison and Advisory Sub-Section of details in these instances.

4. Change of Rate For Stored Heat Load

(a) Method of Dealing with Enquiries - General

All enquiries relating to an inadequate supply of hot water from a storage water heater which, in either case, is not caused by a defect in the installation, together with requests for transfer from one stored heat rate to another, will be referred to the Electricity Development Branch extn. 2262 for investigation and appropriate action.

(b) Insufficient Heating From a Space Heater

All enquiries or complaints from customers relating to insufficient heating from a space heater shall be directed to the Customers' Advisory Section, Electricity Development Branch.

An Emergency Service Officer receiving an inquiry in the field of a type set out in 4(a) and 4(b) shall not make any attempt to alter the rate, but shall ask the customer to 'phone the Electricity Development Branch/Customers' Advisory Section, telephone extension 8 2262 for storage heaters and 8 2278 for space heaters.

ITEM NO. 7 - CUTTING IN TIME SWITCHES ON RATE "A" INSTALLATIONS WHICH INVOLVE CONSIDERABLE LOAD.

During the Winter peak load period when every effort is

made to control the Council's peak demand, an Emergency Service Officer who, after making some check or adjustment, desires to cut-in the time switch of a Rate "A" installation at a large block of flats where the one time switch and contactor controls the supply to a number of tanks, say 10 or 12, should contact the System Operator before doing so if it is probable that the connected load of all or most of the hot water tanks will be in service during the peak periods.

If the System Operator is of the opinion that the cutting in of the tanks could contribute to the recording of a high maximum demand, permission should not be granted.

In such circumstances, either the customers should be told that the supply of hot water should be satisfactory the next morning or, in the case of one tank only being affected combined with an urgent need of hot water, the fuses should be drawn on the remainder of the tank circuits and a later visit made by an Emergency Service Officer to replace them before the normal switching-in time.

ITEM NO. 8 - INTERMITTENT FAULTS IN RATE "A" INSTALLATIONS

When Emergency Service Officers are investigating the reason for lack of hot water from a Rate "A" Storage Water Heater and are unable to determine that there is any definite defect or any reason for unsatisfactory performance, they should not hesitate to change the time switch as it is often difficult to detect intermittent faults in these, by operating the time switch manually.

If no apparent defect can be found, the job should also be referred to the Customer Service Section for checking. Should the customer elect to call in his own Contractor or the manufacturer, he should be informed that the Council will be reluctant to consider any reimbursement for incidental costs involved even though it is subsequently found that the unsatisfactory operation was due to a defect in Council's equipment.

ITEM NO. 9 - TIME SWITCHES - CORRECTING FOR TIME

Officers in the course of their visits to customers' premises shall correct all time switches controlling Rate "A" Storage Water Heaters that have become inaccurate to the extent of one hour or more.

ITEM NO. 10 - TIME SWITCHES STOPPED IN "ON" POSITION

Officers finding a time switch stopped in the "ON" position shall include the meter number and reading in the Service Report.

This will facilitate adjustment in the event of a complaint of "excessive account".

ITEM NO. 11 - TRANSFER OF STORAGE WATER HEATERS FROM RATE "A" TO RATE "B"

Officers working in the field should transfer hot water systems from Off Peak Rate "A" to continuous heating Rate "B" only on receipt of a specific instruction.

In dealing with requests for transfer to continuous heating following a complaint of insufficient hot water, Emergency Service Officers shall, first of all, check to ensure that the system is functioning correctly, then request the customer to telephone The Sydney County Council and ask for the Electricity Development Branch/Customers' Advisory Section where their problem can be satisfactorily dealt with.

Generally speaking customers should not be asked to write to the Council. They should be requested to telephone and discuss the matter with an officer of the Electricity Development Branch/Customers' Advisory Section who is authorised to deal with all requests for transfers of Rate.

Officers instructed to transfer storage water heaters from Rate "A" to Rate "B" shall bridge and label the time switches and record the meter numbers and readings on the Service Report and give this information over radio.

ITEM NO. 11A - HEATERS IN BANKSTOWN, HORNSBY AND BALMAIN AREAS WITH RESERVOIR CAPACITY OF LESS THAN 35 GALLONS OR WITH ELEMENT RATING OF MORE THAN 60 WATTS PER GALLON.

Heaters of less than 35 gallons capacity which were supplied at Rate "A" prior to the transfer of the areas may continue to be supplied at Rate "A". If the amount of water delivered by a heater is inadequate for the customer's purposes when time control is installed, the heater may be supplied at Rate "B" or the General Rate applicable to the installation whichever is to the customer's advantage.

Heaters which have element ratings of more than 60 watts per gallon, and were supplied Rate "A" prior to the transfer of the areas, may continue to be supplied at Rate "A". If the amount of water delivered by the heater is inadequate for the customer's purposes when time control is installed, the heater may be supplied at the General Rate applicable to the installation, but not at Rate "B".

Any reports of insufficient hot water from such systems shall be referred to the Electricity Development Branch (Customers' Advisory Section).

ITEM NO. 12 - CHECKING THE RATING OF WATER HEATERS

To establish whether the heating element of a water heater is in sound condition OR of the correct wattage, it is necessary to cut-in the supply to the heater and count the number of revolutions in one minute of the KWH meter disc. The speed (Revs. per KWH) marked on the meter is also noted and the load on the meter obtained from the formula -

$$\text{Load in KW} = \frac{\text{R.P.M.} \times 60}{\text{Revs. per K.W.H. (shown on meter)}}$$

e.g.

If the revolutions of the meter is 16 in one minute on a 400 Revs./KWH meter, then the load is

$$\begin{aligned} & \frac{16 \times 60}{400} \\ & = 2.4 \text{ KW.} \end{aligned}$$

This method may be applied to determine the load under any circumstance on any type of K.W.H. meter.

ITEM NO. 13

The temperatures and quantities of water used on each occasion are as follows:-

IMPERIAL

- (a) An average shower used 5 gallons at 100°F.
- (b) An average bath uses 15 gallons at 100°F.
- (c) Six inches of water in a 5'6" bath is 20 gallons.
- (d) An average family dish washing uses 1½ gallons, at 140°F.
- (e) Water below 135°F. is too cold for dish washing.
- (f) The temperature of the water in the tank of a storage hot water system is maintained at 140°F. to 180°F.
- (g) Water boils at 212°F.
- (h) Bath temperature is approximately 100°F.
- (i) Five gallons at 180°F. when mixed with cold water will give 15 gallons at 100°F.

The average temperature of water in Sydney is 10°C to 13°C in winter.

METRIC

- (a) An average shower uses 23 litres at 38°C
- (b) An average bath uses 68 litres at 38°C
- (c) 150mm of water in a 1.7m bath is 90 litres
- (d) An average family dishwashing uses 7 litres at 60°C
- (e) Water below 57°C is too cold for dishwashing
- (f) The temperature of the water in a storage hot water system is maintained at 60°C to 82°C
- (g) Water boils at 100°C
- (h) 23 litres at 82°C when mixed with cold water will give 68 litres at 38°C.

Energy Consumption is at the rate of

1 KWH per 3 gallons for a 100°F rise.
1 KWH per 14 litres for a 55°C rise.

ITEM NO. 14 - AIR LOCK

Air lock may arise in hot water pipes under the following circumstances:-

- (A) Hot water pipe rises above ceiling heater outlet. This more frequently occurs on falling level heaters and is noticed when the level of water in the heater falls below the high level of the hot water pipe. If there are sharp bends in the pipework at this point air may be locked in at these points preventing flow and the normal low pressure supplied by the heater may not be sufficient to force the air through the pipes. The air lock in this case prevents flow at all outlets.

It should be noted that these conditions are similar to a reduction in the available capacity of a falling level heater. Under no circumstances should hot water pipes rise above the outlet of a ceiling heater.

- (B) Hot water pipe falls steeply and then rises steeply to a point where there is a comparatively low head at the outlet (e.g. shower outlet) and there are sharp bends at the lower level. Air enters the pipework if the full capacity of the heater, or of the c.w. feed tank in the case of displacement heaters, is used and the low pressure is not sufficient to force the air through the sharp bends at the lower level. The air lock in this case may prevent flow at all outlets or only at some outlets.
- (C) On displacement heaters air is sucked in through vent pipe and air lock occurs at a sharp bend. Possible causes of air being sucked in are:-

- water level too low in feed tank
- poor cold water supply allows feed tank water level to fall appreciably
- water tends to leave heater faster than it enters due to inlet having smaller bore than outlet or perpendicular hot water pipe fall from heater giving accelerated flow from heater when number of taps are "on", particularly noticeable in industrial or commercial installations.

Removal of Air Locks

- (A) Permanent correction - The only permanent correction for air locks is a re-routing of the hot water pipes, but this is not always practicable. It should be remembered that except in the case of hot water pipes rising above the heater outlet, air locks will

usually only occur if the c.w. supply to the heater fails and the capacity of the feed tank is used or the full capacity of the heater is used. These are unusual circumstances in most cases and their infrequency generally does not warrant extensive rerouting of pipework.

Rerouting of h.w. pipes should not be discussed with the customer. Refer the case to the Appliance Repair Section.

- (B) Normal Removal - If no flow at all taps make sure hot control valve in open and there is no blockage in cold water supply to heater. If no flow at one outlet only, make sure there is no blockage in tap. If satisfied air lock exists select a hot water tap at which there is no flow and which is located near a cold water tap, loosely connect a short piece of hose from c.w. tap to h.w. tap, open c.w. tap and allow c.w. to flow for about 10 secs. This may force air out or from vent pipe. If the air lock cannot be cleared by using a piece of hose between the taps and turning the taps on, the job should be referred to a plumber or the Sales Branch for further attention. On no account must taps be dismantled.

ITEM NO. 15 - TYPES OF HEATERS

Electric storage water heaters giving a full hot water service are available in the following types:-

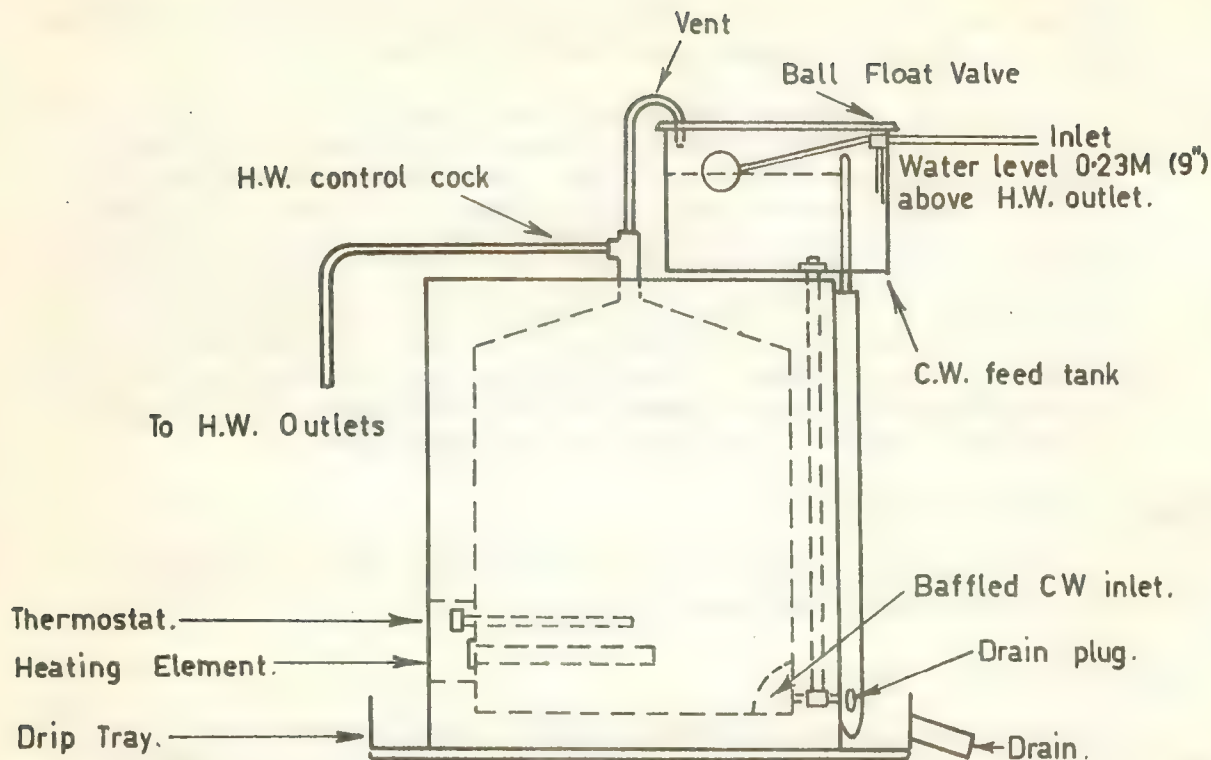
(a) Ceiling Type Heaters

Mounted in the ceiling above highest outlet supported on a platform and provided with a drip tray and drain pipe in case of overflow. Cold water feed into the heater is through a cistern type copper feed tank under ball valve control. All parts in contact with water copper or copper alloy. Two types of ceiling heaters:-

(Fig. i) Displacement Heater

- Cold water inlet at bottom
- Hot water outlet at top
- C.W. feed tank on top of heater with water level maintained approximately 0.23m (9") above hot water outlet. This gives a head of 0.23m (9") on the outlet so that immediately a hot tap is opened, water flows. Heater is constantly under a low pressure head.
- To prevent excess pressure or vacuum forming in heater a vent pipe is taken from top of heater to exhaust over C.W. feed tank.

CEILING TYPE
Displacement Heater.



A small number of displacement heaters have been produced in which the feed tank is placed on the side of the heater and the outlet is on the side below the water level in the cold water feed tank.

It will be noted that during daytime when there is not electricity supply to the heater and hot water is being used there is cold water in the bottom of the heater and hot in the top. Since the water is almost static there is for all practical purposes no mixing between the hot and cold water and the full capacity is available as useful hot water.

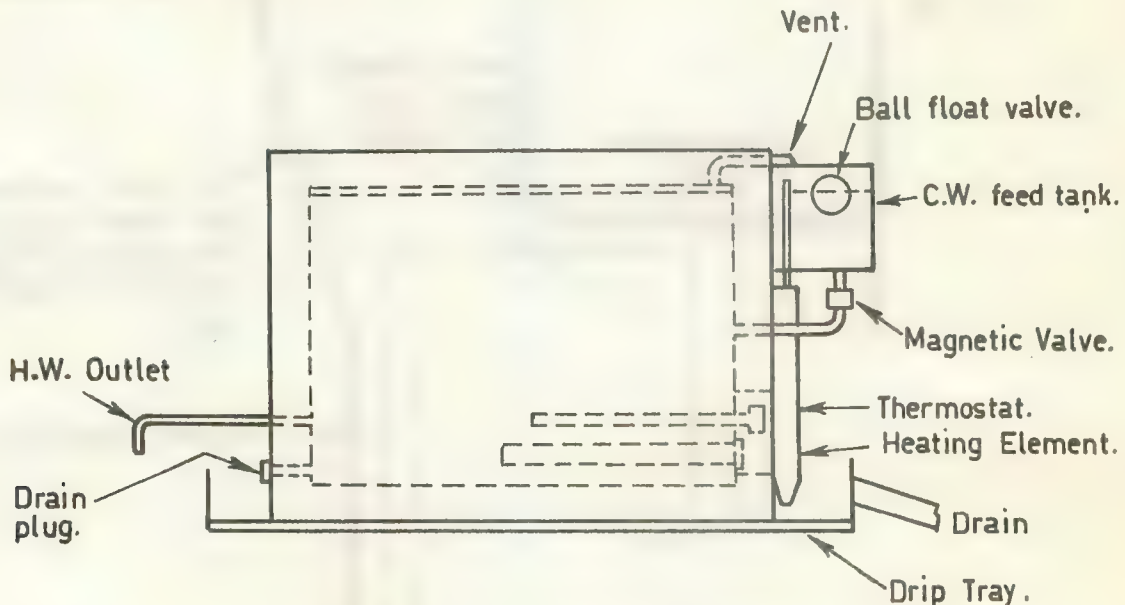
(ii) Falling Level Heater (excluding Joseph Auto-Hot and Simplex controller type)

- Cold water inlet between middle and top
- Hot water outlet near bottom
- Cold water feed tank on side of heater with water level maintained approximately 18mm (3/4") below top of heater container

- A vent pipe from top of heater exhausts into c.w. feed tank
- Heater is provided with a controller in the form of an electrically or thermally operated valve which prevents cold water entering the heater when the time switch is "off".
- Heater functions as a large automatic urn, the water level falling throughout the day as hot water is used.

CEILING TYPE

Falling Level Heater.

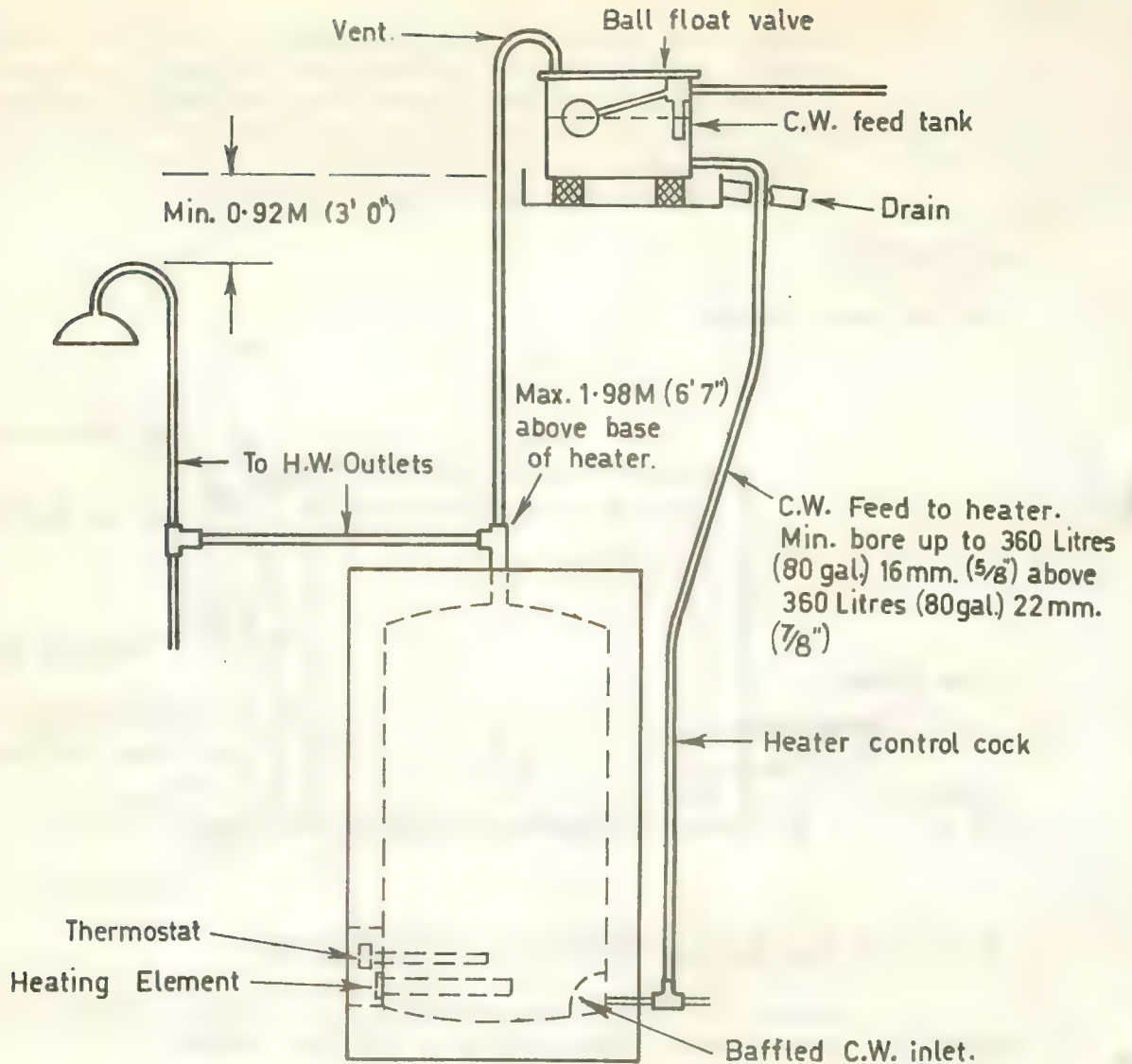


(b) Floor Type Heaters (other than Mains Pressure)

Mounted on floor or in basement. All parts in contact with water copper or copper alloy. Heaters are of the displacement type with c.w. inlet at bottom and hot water outlet at top:-

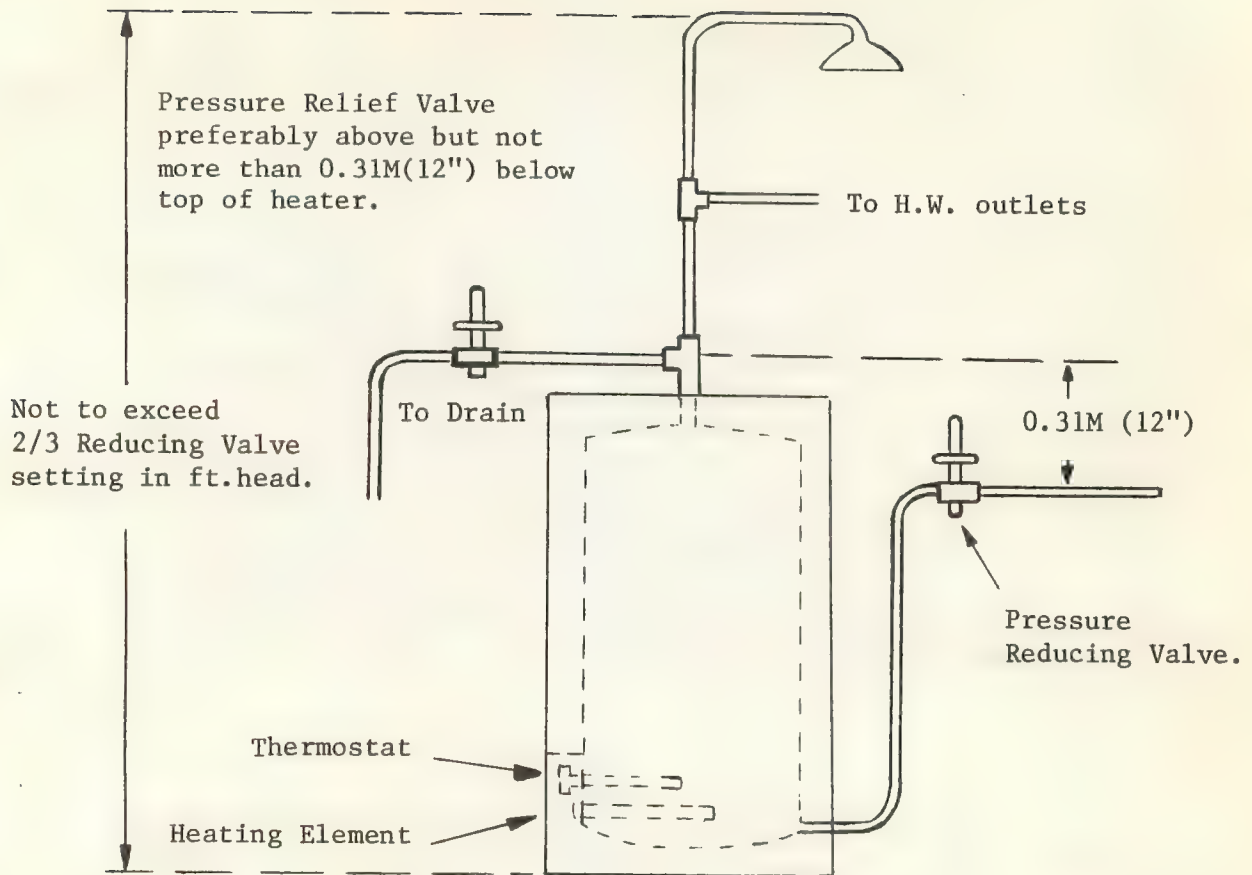
(i) Cistern Fed Heater

- C.W. feed tank detached from heater and mounted at least 1 metre (3 ft.) above highest outlet to be supplied
- Operation similar to ceiling type displacement heater
- Container needs to be of heavier gauge to withstand pressure head.



(ii) Valve Controlled Type

- Cold water feed to heater through a pressure reducing valve which ensures that the safe marking pressure of the heater is not exceeded.
- Build up of a dangerous pressure in heater prevented by a pressure relief valve on the outlet side of heater erected 0.31 metre (12") above the reducing valve with a waste pipe to drain and adjusted to exhaust at approximately 14kPa (2 lb. per sq. inch) above pressure reducing setting. In some cases pressure relief is provided through a vent pipe exhausting at a height of 0.62 metres (2') above the reduction valve setting in feet head,
- In some heaters the valves are housed in a compartment on top of the heater.



(c) Mains Pressure Heaters

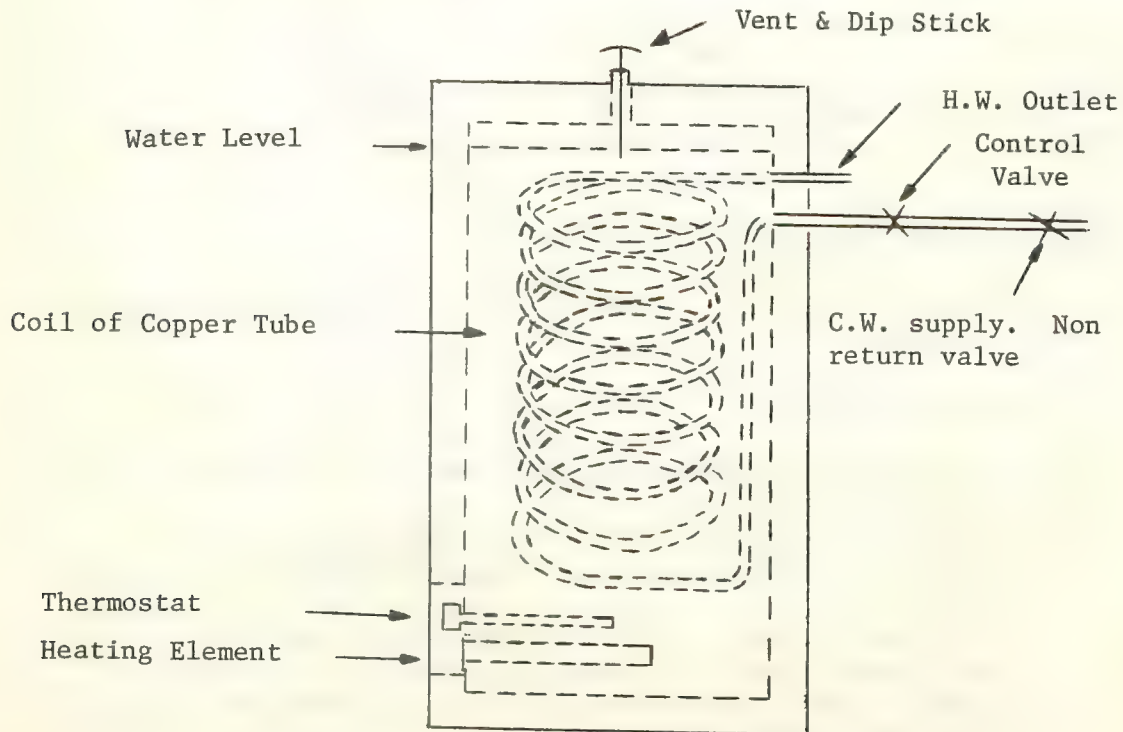
Connected direct to c.w. mains mounted on floor or in basement, two types of heaters:-

(i) Displacement Heater

- Cold water feed through a non-return valve to prevent feed back into c.w. mains.
- Pressure relief valve with drain connection on c.w. side.
- Usually galvanised steel container to withstand full mains pressure.
- Sometimes provided with a container connected to c.w. side which feeds a special element into cold water to prevent discoloration of water and corrosion of container.
- Operation similar to other types of displacement heaters.
- High pressure permits use of much smaller bore hot water pipes.

(ii) Coil (Heat Exchanger) Type.

- Copper container filled with static water to free water level, open to air through top vent, dip stick provided, and electrically heated.
- Coil of copper tube (approximately 30m (100 ft.) of 19mm. (3/4") O.D. tube) inside container, bottom end connected to c.w. supply, through non-return valve, top end to h.w. outlets.
- Water in tube heated by tubes contact with hot static water in container.
- With no hot water being drawn off water in tube coil reaches approximately same temperature as static water in container but when this quantity (approximately 11 litres (2 gallons) has been drawn off, cold water has to pick up heat from hot water in container as it passes through the coil. In practice, the temperature of the delivered hot water may fall to approximately 49°C (120°F) if fairly substantial draw-offs are made for a washing machine and bath, but recovers to approximately 57°C (135°F) in approximately 30 mins. if no further hot water is drawn off.
- For effective operation the temperature of the static water in the container should be maintained at approximately 77°C (170°F). The coil type heater is therefore essentially for continuous heating (Rate B), a very reduced service only would be available on off-peak (Rate A) supply. Many heaters of this type are installed on continuous heating in Queensland.



When hot water is drawn off an equivalent quantity of colder water enters the heater from the feed tank. Assuming the time switch is "off", the temperature of water in the inner container will progressively fall with each draw-off until the heater is full of water at 60°C (140°F.), the water in the feed tank is then 25mm. (1") to 38mm. ($1\frac{1}{2}$ ") above the inlet to the inner container. At this stage the adjusting rod attached to the end of the controller lever holds the ball float up and the valve closes and stops the flow of any further cold water into the side feed tank and heater.

It should be noted that as the water temperature has fallen below 80°C (176°F.), the mercury switch is now closed ready for heating to commence immediately the time switch closes. See Fig. 3.

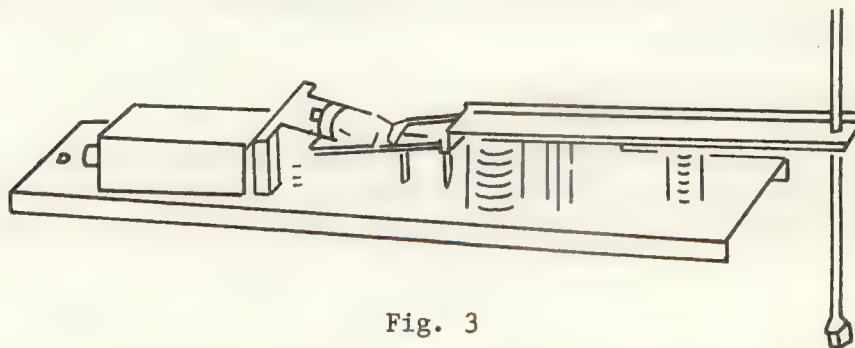


Fig. 3

Controller when heater contents are BELOW 60°C (140°F.).
Ball valve and mercury switch both closed by controller.

Allowing for some small drop in temperature during the day, the heater will continue to deliver water at not less than 57°C (135°F.), which is slightly above the minimum temperature necessary to melt fats. When the water level in the inner container falls to the level of the heater outlet, no water will be available from the hot water taps until the commencement of the next heating period.

When the time switch restores supply, the element will commence to heat. As the water reaches 57°C (135°F.), the controller bellows start to expand and at 60°C (140°F.) it overcomes the spring pressure and the controller lever commences to drop. The adjusting rod then ceases to hold up the ball arm and water slowly flows into the feed tank and inner container until they are full. Heating continues until water reaches full temperature of 82°C (180°F.).

If this condition is reached prior to the end of the "off-peak" period, the mercury switch will cycle to maintain water temperature at approximately 82°C (180°F.) during the remainder of the heating period.

Item No. 16 (Cont'd.)

(3) Types of Controllers

The "Joseph" controller is manufactured in single, two and three phase types. The mercury switch is rated at 15 amps. A.C. or D.C.

The single phase controller is used on heaters having capacities up to 450 litres (100 gallons) and not exceeding a loading of 3.6 kW. It is also used for heaters in excess of 1350 litres (300 gallons) for operating the energising coil of a triple pole contactor.

Two phase controllers are used on heaters of 545 litres (120 gallon) and 680 litres (150 gallon) capacity having loadings of 5.0 and 6.0 kW respectively. Three phase controllers are used on heaters having a capacity between 900 litres (200 gallons) and 1350 litres (300 gallons) with loadings of 8 and 12 kW respectively.

Item No. 16A - Joseph Hot Water Tanks

Joseph - Auto Hot still continue to make the old type tank as described in Item 16 when required for any special purpose, but they now manufacture a new type of "Falling Level Tank", and also a Displacement type tank.

Falling Level Tank

This type of tank has a clamp on thermostat and a calrod sheathed type element.

The flow of water is still controlled by a Thermal Bellows which allows water to flow into the tank through an inverted elbow in the upper portion of the tank until the water temperature drops to approximately 60°C (140°F.). A full tank of water is then available at this temperature. In all, the Joseph falling level tank delivers 25% more hot water than the given tank capacity.

These tanks are particularly suitable in areas where the water pressure is poor, the tank filling slowly during the night heating period. (See Sketch 1)

Displacement Tank (Side Feed)

This tank has a clamp on thermostat and a calrod sheathed type element.

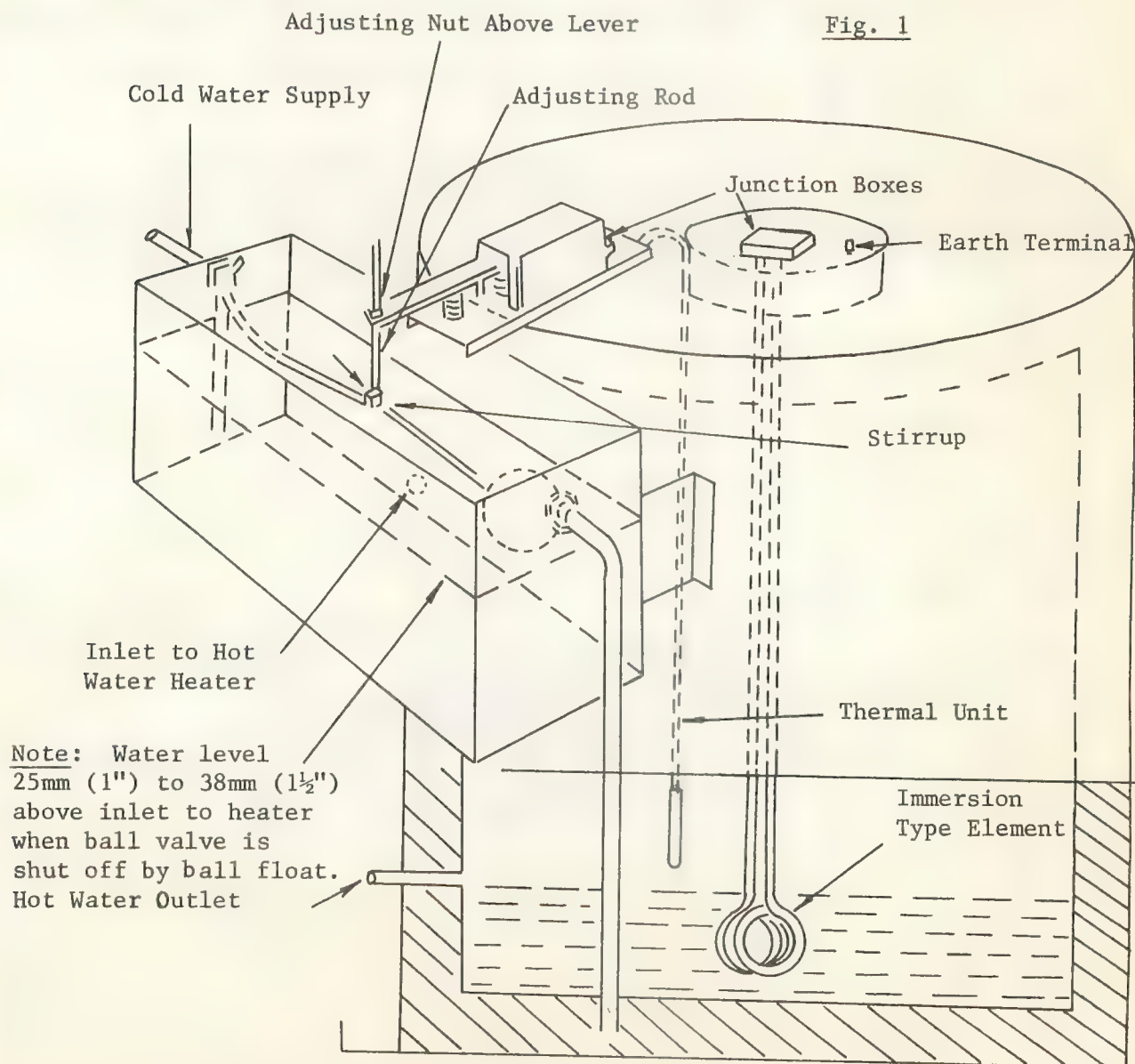
The cold water is piped from the side feed tank to the bottom of the tank; the pressure in the feed tank which must be maintained at the marked fixed level by the ball valve gives sufficient pressure to deliver water which is drawn off near the top of the water in the tank about level with the bottom of the feed tank. (See Sketch 2)

ITEM NO. 16 - "JOSEPH AUTO-HOT" STORAGE WATER HEATER
(FALLING LEVEL TYPE)

1. Heater Details

- (a) Cold water feed tank is attached to the side of the outer casing.
- (b) Immersion type element inserted loosely through top of the heater.
- (c) Thermostatic electric and cold water controller secured to the top.

The layout of these components are detailed in Fig. 1.



(2) Operation of Heater

Thermostatic controller consists of:-

- (a) A lever arm, pivoted near centre under spring tension and supported on a base mounted on top of heater.
- (b) Mercury switch or switches mounted at one end of arm control electricity to element cutting out at approximately 82°C (180°F.) and cutting in at approximately 80°C (176°F.)
- (c) Adjustable rod from other end of lever arm to ball valve arm controlling cold water entry to heater to shut off below 60°C (140°F.)
- (d) Temperature sensitive element consisting of bulb, capillary tube and bellows.

At the end of the heating period, the water in the heater will be at a temperature of 82°C (180°F.) approximately and the same level as the colder water in the side feed tank. The mercury switch will be tilted to the "OFF" position and the uplift pressure taken off the ball arm so that cold water can flow into the side feed tank immediately the ball arm drops. See Fig. 2.

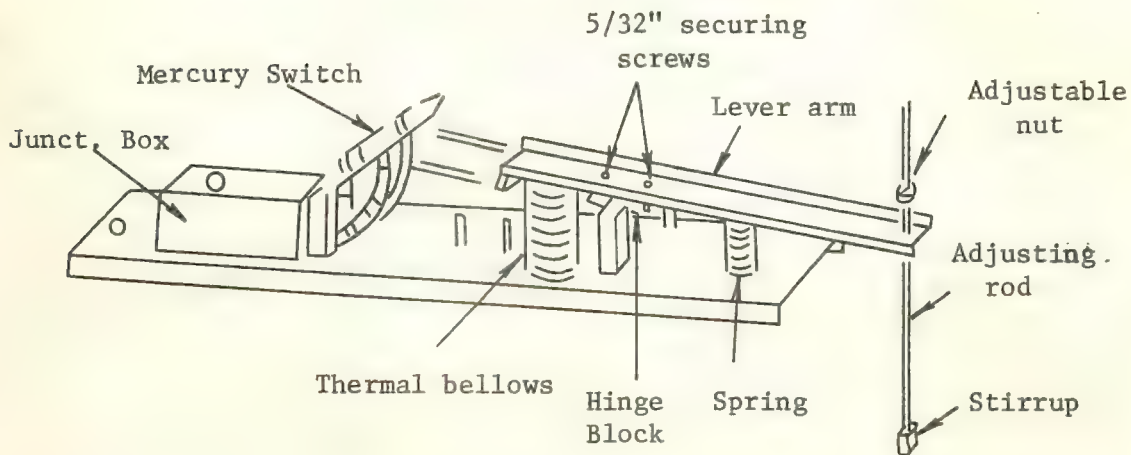


Fig. 2

Controller when heater contents are ABOVE 60°C . (140°F.)
 Ball valve free to open, mercury switch opened by controller.

When hot water is drawn off an equivalent quantity of colder water enters the heater from the feed tank. Assuming the time switch is "off", the temperature of water in the inner container will progressively fall with each draw-off until the heater is full of water at 60°C (140°F.), the water in the feed tank is then 25mm. (1") to 38mm. ($1\frac{1}{2}$ ") above the inlet to the inner container. At this stage the adjusting rod attached to the end of the controller lever holds the ball float up and the valve closes and stops the flow of any further cold water into the side feed tank and heater.

It should be noted that as the water temperature has fallen below 80°C (176°F.), the mercury switch is now closed ready for heating to commence immediately the time switch closes. See Fig. 3.

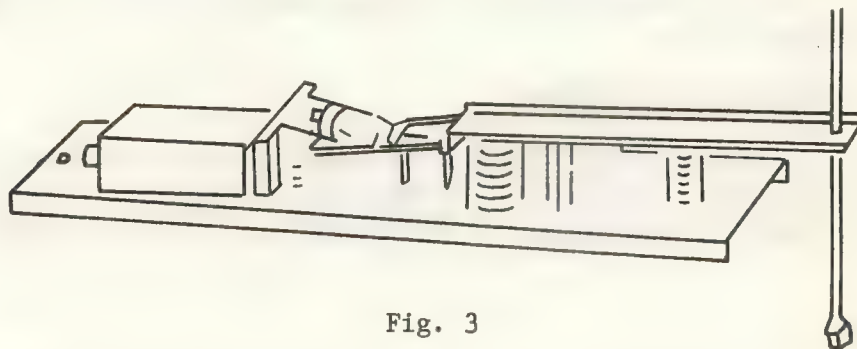


Fig. 3

Controller when heater contents are BELOW 60°C (140°F.).
Ball valve and mercury switch both closed by controller.

Allowing for some small drop in temperature during the day, the heater will continue to deliver water at not less than 57°C (135°F.), which is slightly above the minimum temperature necessary to melt fats. When the water level in the inner container falls to the level of the heater outlet, no water will be available from the hot water taps until the commencement of the next heating period.

When the time switch restores supply, the element will to heat. As the water reaches 57°C (135°F.), the controller to expand and at 60°C (140°F.) it overcomes the spring pressure controller lever commences to drop. The adjusting rod pushes up the ball arm and water slowly flows into the feed tank until they are full. Heating continues until water reaches of 82°C (180°F.).

If this condition is reached prior to the next heating period, the mercury switch will cycle to close at approximately 82°C (180°F.) during the re.

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Item No. 16 (Cont'd.)

(3) Types of Controllers

The "Joseph" controller is manufactured in single, two and three phase types. The mercury switch is rated at 15 amps. A.C. or D.C.

The single phase controller is used on heaters having capacities up to 450 litres (100 gallons) and not exceeding a loading of 3.6 kW. It is also used for heaters in excess of 1350 litres (300 gallons) for operating the energising coil of a triple pole contactor.

Two phase controllers are used on heaters of 545 litres (120 gallon) and 680 litres (150 gallon) capacity having loadings of 5.0 and 6.0 kW respectively. Three phase controllers are used on heaters having a capacity between 900 litres (200 gallons) and 1350 litres (300 gallons) with loadings of 8 and 12 kW respectively.

Item No. 16A - Joseph Hot Water Tanks

Joseph - Auto Hot still continue to make the old type tank as described in Item 16 when required for any special purpose, but they now manufacture a new type of "Falling Level Tank", and also a Displacement type tank.

Falling Level Tank

This type of tank has a clamp on thermostat and a calrod sheathed type element.

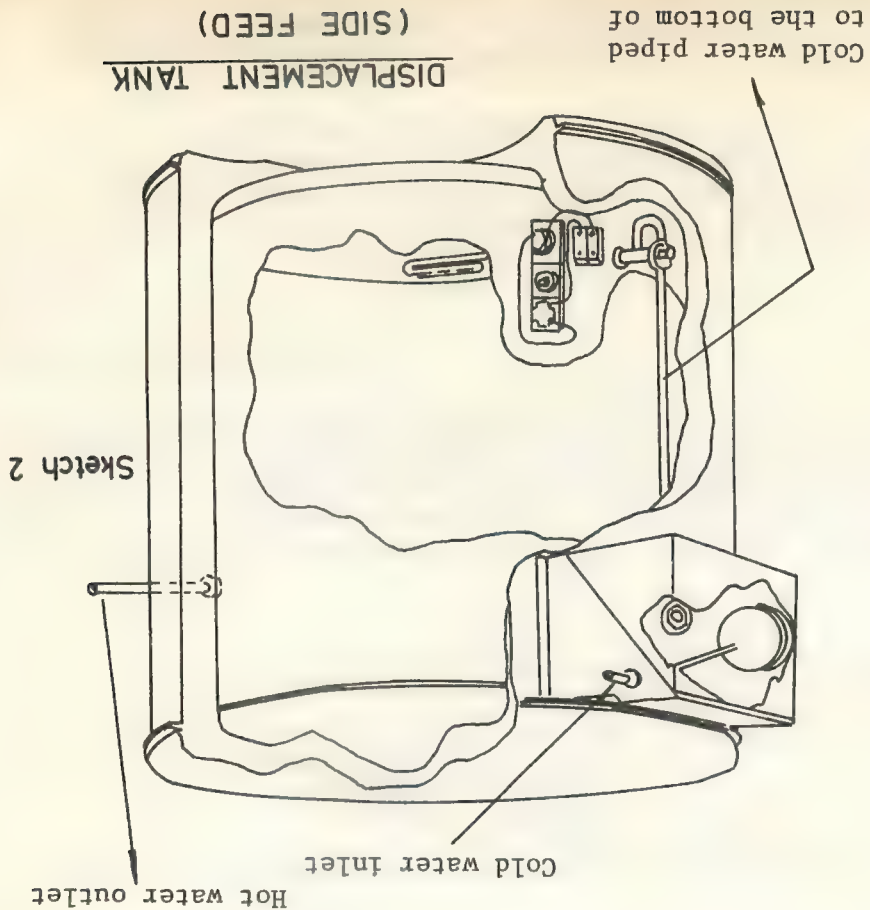
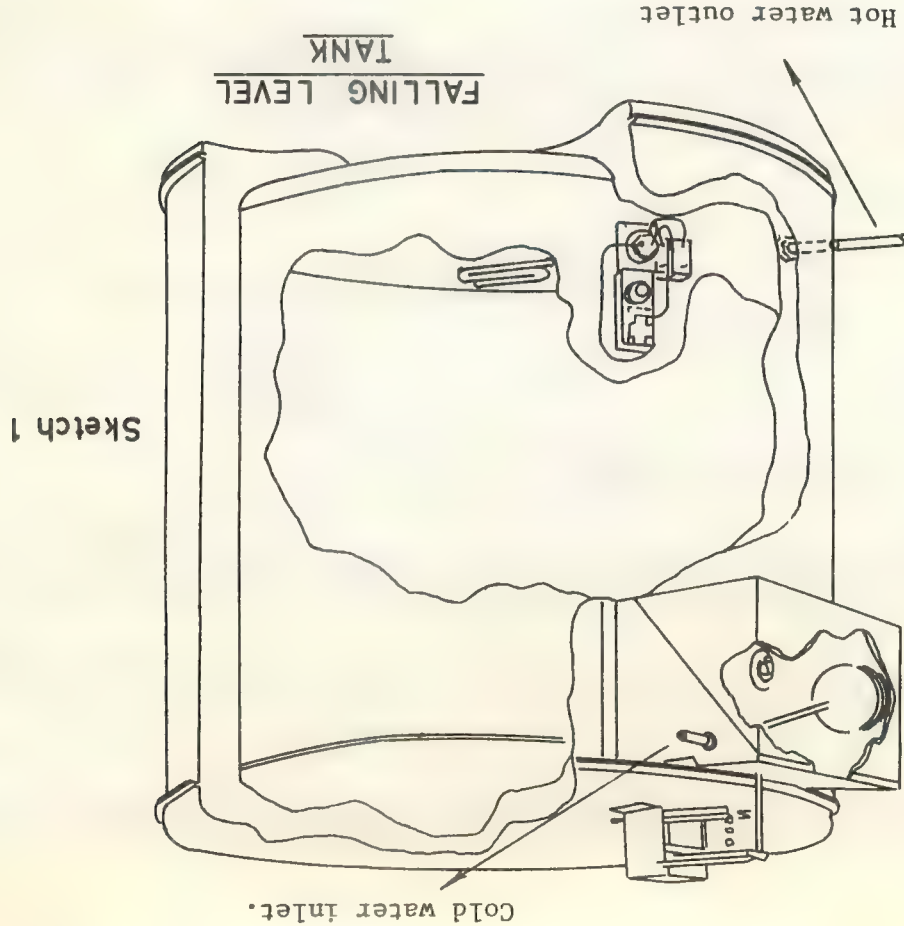
The flow of water is still controlled by a Thermal Bellows which allows water to flow into the tank through an inverted elbow in the upper portion of the tank until the water temperature drops to approximately 60°C (140°F.). A full tank of water is then available at this temperature. In all, the Joseph falling level tank delivers 25% more hot water than the given tank capacity.

These tanks are particularly suitable in areas where the water pressure is poor, the tank filling slowly during the night heating period. (See Sketch 1)

Displacement Tank (Side Feed)

This tank has a clamp on thermostat and a calrod sheathed type

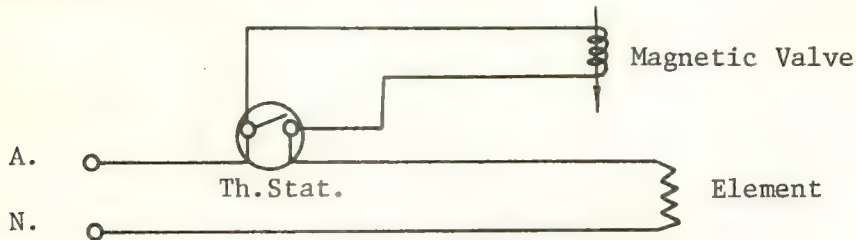
The cold water is piped from the side feed tank to the bottom of the pressure in the feed tank which must be maintained at the level by the ball valve gives sufficient pressure to deliver water drawn off near the top of the water in the tank about level with the top of the feed tank. (See Sketch 2)



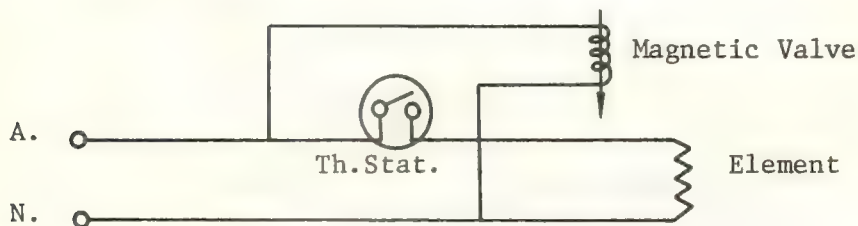
ITEM NO. 17 - FALLING LEVEL HEATERS - MAGNETIC VALVE TYPE(1) TYPES

Magnetic Valve type falling level heaters may be of either of the following types:-

- (a) Magnetic valve connected across thermostat terminals (in series with element when contacts open). Confined to older model single phase heaters.



- (b) Magnetic valve connected across the line on line side of thermostat (valve opens immediately time switch closes). Now used on all heaters, water flow restrictor used on heaters below 900 litres (200 gallon) capacity.



Note: On some heaters it will be found that the magnetic valve has been connected across the load side of the thermostat. In such cases the magnetic valve shall be reconnected across the line side. If the valve is being replaced a vertical restrictor shall be fitted on heaters below 900 litres (200 gallon) capacity.

(2) VALVE ACROSS THERMOSTAT TERMINALS(a) Operation

- (i) At commencement of heating period, water temperature has fallen sufficiently to close thermostat contacts, valve coil bridged out of circuit and plunger valve is closed, supply is available to element.
- (ii) The water temperature in heater rises, the thermostat contacts open and supply to the element is disconnected. Magnetic valve coil is now in circuit in series with

ITEM NO. 17 (Cont'd.)

element, the plunger valve is lifted and cold water enters until the thermostat contacts again close. The cycle of heating and filling is repeated and continues until the heater is full, when the ball valve shuts off the cold water.

(b) Disadvantages of this method of connection

- (i) If thermostat points weld together, cold water cannot enter heater which will boil dry.
- (ii) Approximately 1 hour heating period is lost due to elements not heating when heater is filling. Therefore, it is possible that the heater will not completely fill during the "off peak" period if a large quantity of water has been drawn off the previous day.

(c) Advantages of this method of connection

- (i) The flow of cold water into the heater is controlled by the thermostat so that the temperature of hot water is maintained at or near the thermostat setting.

(3) VALVE ACROSS LINE SIDE OF THERMOSTAT(a) Operation

At commencement of heating period when time switch closes, the plunger valve lifts and remains in the open position until the time switch opens at the conclusion of the heating period. Water flows into heater until ball valve shuts off.

(b) Disadvantages of this method of connection

If restrictor is not fitted, immediately time switch closes the hot water in the heater may be cooled by the influx of cold water. This condition could arise between the hours of 9 p.m. and 1 a.m. when baths or showers may be taken.

(c) Advantages of this method of connection

- (i) If restrictor is fitted, the flow of cold water into heater is restricted, and would not adversely affect the temperature of any hot water in the heater during filling.
- (ii) The full benefit of the heating period is gained as determined by the time switch.
- (iii) The customer is assured of a full heater of water at a useful temperature, although in the early part of the heating period the water may be a little below useful kitchen temperature, particularly where all or nearly all the water has been used the previous day.
- (iv) Danger of boiling is eliminated.

ITEM NO. 18 - "SIMPLEX" (EARLY MODELS) FALLING LEVEL TYPE.(1) HEATER DETAILS.

- (a) First Model. Thermostat controlling electricity and cold water supply. Controller attached to side of outer casing. Capillary tube through and sometimes soldered to top of inner container and attached to element. Ball valve located inside heater. Immersion type element inserted through top of heater with coiled section of element and actuating bulb located in copper pot on base of heater. Cold water inlet discharges into copper pot.
- (b) Second Model. Similar to first model except that ball valve is located in feed tank secured to side of outer casing. Controller between cold water mains and feed tank.
- (c) Super Model. Similar to second model except that 48mm. (1 7/8") dia. bobbin type element in sheath is used and actuating bulb is located in sheath through side of heater.
- (d) Modified Heaters.

In most cases the above heaters have been modified by the Council as follows:-

- (i) Cold water mains disconnected from controller and reconnected to mains pressure magnetic valve. Controller used as thermostat only, with capillary tube and actuating bulb located in copper sheath through top of container.
- (ii) Cold water mains disconnected from controller and reconnected to ball valve on side feed tank. Low pressure magnetic valve connected between feed tank and heater. Controller used as thermostat only.
- (iii) Controller in use as thermostat only replaced by special "Wilcolator" (Aust.) D.P. thermostat with 1.76m. (68½") capillary tube.

(2) OPERATION OF HEATER.

- (a)
- Original Controller connected to cold water mains pressure.

Thermostatic controller consists of:-

- (i) Temperature sensitive element comprising actuating bulb, capillary tube and bellows.
- (ii) Spring loaded water valve.
- (iii) Mercury switch. (On some models a spring is used to return the switch to "ON" position, other models weight of switch and bracket is relied on).

At the end of the heating period the water in the heater is approx. 82°C (180°F.) and at the same level as the water in the feed tank. The mercury switch is tilted "off" and the water valve is open. Cold water can now flow through the controller into feed tank or inner container immediately hot water is drawn off and the ball arm drops.

Hot water drawn off is replaced by an equivalent quantity of cold water until the temperature of the water in heater drops to 65°C (150°F.), when the water valve on the controller closes and stops the flow of any further cold water into the heater or side feed tank.

It should be noted that as the water temperature has fallen below approx. 79°C (175°F.), the mercury switch has now closed ready for heating to commence immediately the time switch closes.

Allowing for some small drop in temperature during the day, the heater will continue to deliver water at approx. 65°C (150°F.) and flow will only cease if the full capacity of the heater is used.

When the time switch restores supply, the element commences to heat. As the water reaches 65°C . (150°F.), the controller bellows start to expand, overcomes the spring pressure, and opens the water valve. Cold water then flows slowly through the ball valve and feed tank (where feed tank is fitted) into the inner container to maintain a temperature of not less than 65°C (150°F.) and until the heater is full. Heating continues until water reaches full temperature at 82°C . (180°F.).

If this condition is reached prior to the end of the "off-peak" period, the mercury switch will cycle to maintain water temperature at approximately 82°C . (180°F.) during the remainder of the heating period.

- (b) High, or low pressure magnetic valve connected across the line, and controller used only as thermostat. (Note, Controller may have been replaced with thermostat.

Operation similar to other types of falling level heaters (excepting Joseph Auto-Hot), i.e., magnetic valve opens and permits flow of cold water into feed tank of heater immediately time switch cuts in at commencement of heating period.

- (c) Low pressure magnetic valve connected across thermostat terminals and controller used only as thermostat. Note, Controller may have been replaced with thermostat).

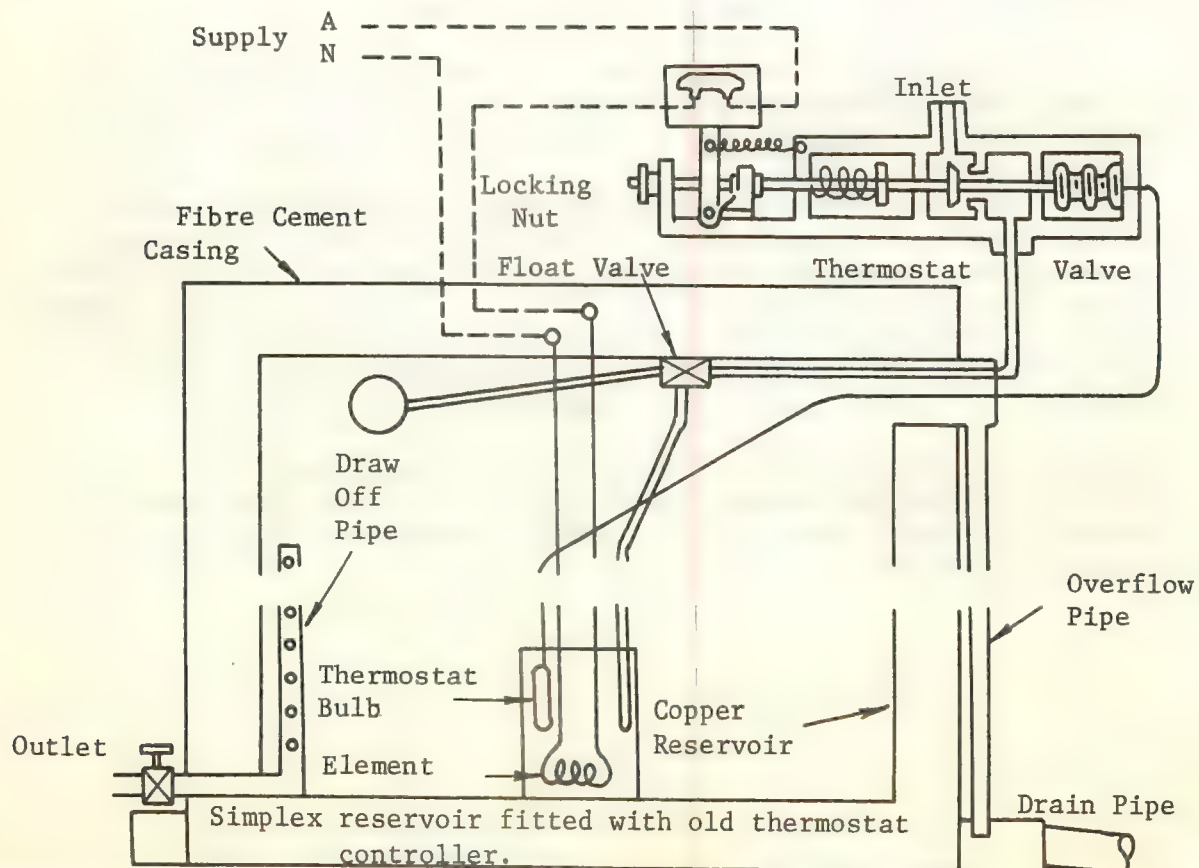
Operation similar to other types of falling level heaters (excepting Joseph Auto-Hot), i.e., magnetic valve is cycling.

(3) TYPES OF CONTROLLERS

Two different types of controllers were fitted to "Simplex" heaters and shall be referred to as follows:-

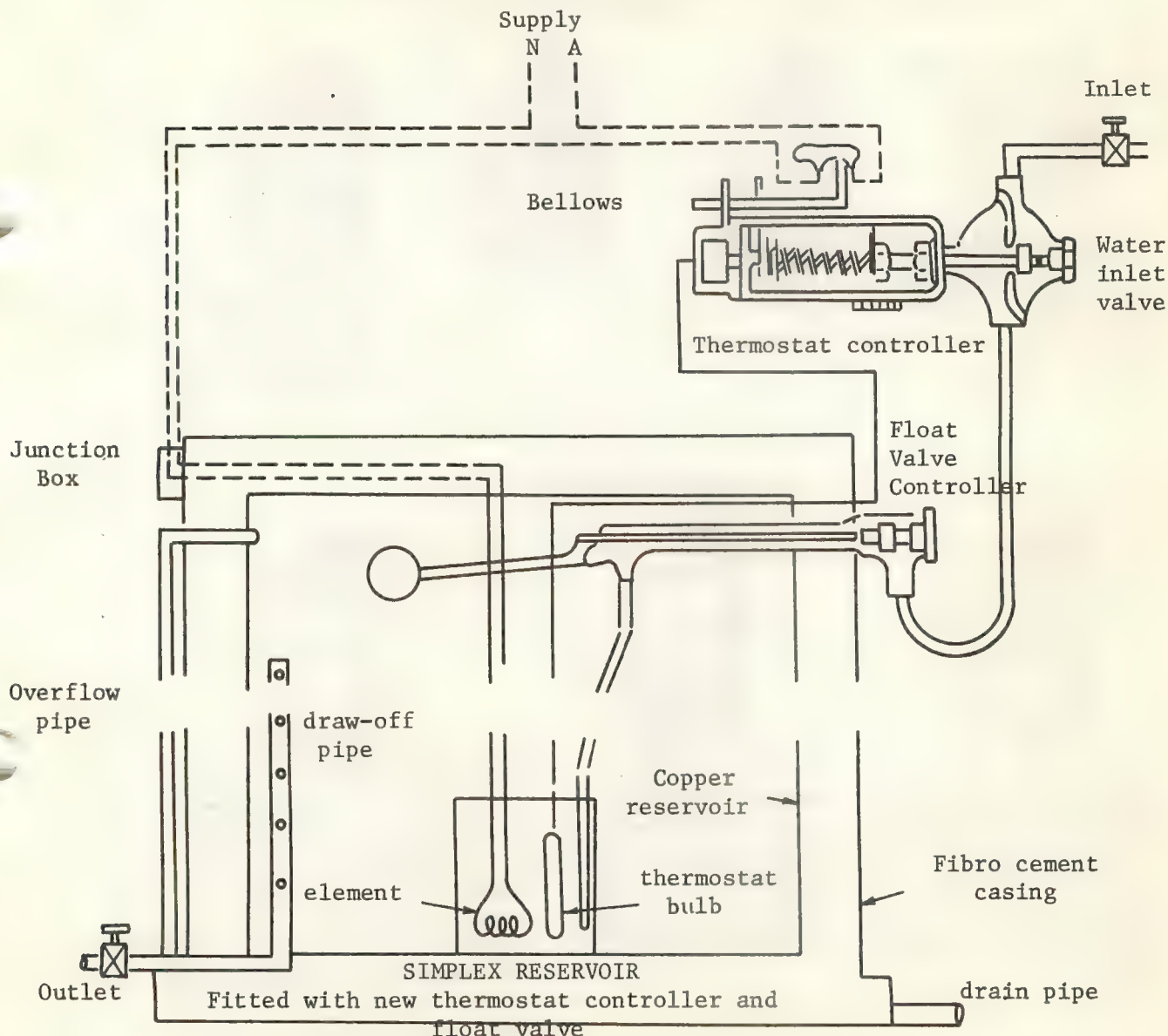
- (a) Old type - Identified by:-

- (i) Protected by semi-circular cover hinged on controller.
- (ii) Controller secured to heater outer casing with two brass saddles, screws and nuts.
- (iii) General construction based on two brass pieces screwed together, with mercury switch at end.



(b) New type - identified by:-

- (i) Protected by box type cover screwed to heater outer casing.
- (ii) Controller secured to heater outer casing by two $\frac{1}{4}$ " studs and nuts.
- (iii) General construction based on large brass casing, with mercury switch on top.

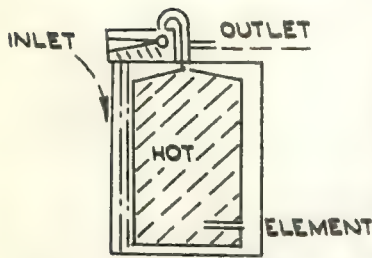


The "Simplex" controller was manufactured in single, two and three-phase types. The mercury switch is rated at 15 amps. A.C. or D.C. The single phase controller is used on heaters having capacities up to 450 litres (100 gallons) and not exceeding a loading of 3.6 kW. It is also used for heaters with loadings in excess of 3.6 kW for operating the energizing coil of double the triple pole contactors. Some heaters with ratings in excess of 3.6kW are fitted with 2 or 3 phase controllers.

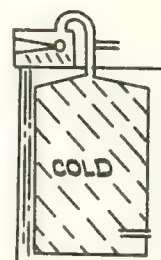
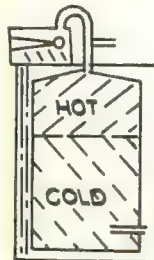
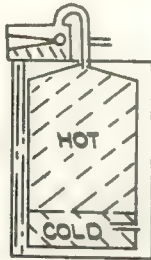
ITEM NO. 19 - CYCLE OF OPERATIONS OF VARIOUS TYPES

A Displacement Type

Using Period

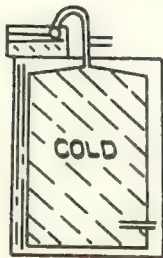


360 litres (80 gals)
of Hot Water at 82°C.
(180°F.)

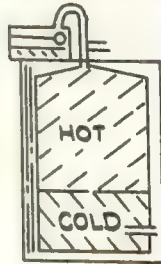


All hot water
used. Cold
water will now
flow from taps,

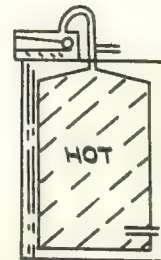
HEATING PERIOD.



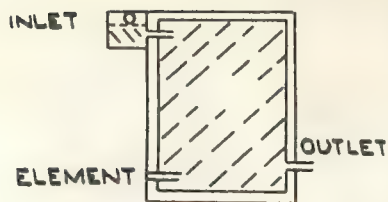
At time of cut in of
time switch the tank
is full of water at
a temperature which
will depend upon the
quantity of hot water
drawn off the previous
day.



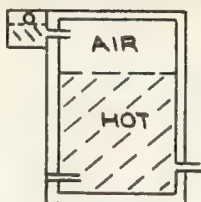
Heating going on.
Hot water rises to
top. Turbulence
due to this action
takes place thus
mixing all water
to one temperature



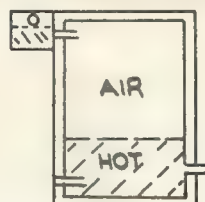
When temperature reaches
that set on the thermo-
stat, usually 82°C (180°F),
the thermostat cuts the
supply off. If water is
very cold, this could
require 10 hrs. of heating.
If temperature drops due to
losses of water being
drawn off and more cold
water entering during the
time the time switch is
"ON" the thermostat cuts
the supply on again until
the temperature reaches
82°C (180°F.)

(b) FALLING LEVEL TYPE MAGNETIC VALVE ACROSS THERMOSTAT

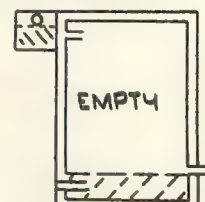
360 litres (80 Gals.)
of Hot Water at 82°C.
(180°F.)



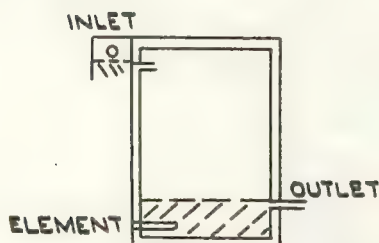
120 litres
(26.6 Gals)
used.



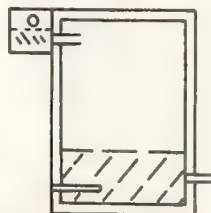
240 litres
(53 Gals.)
used.



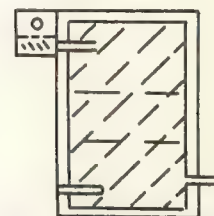
All hot water
used - no water
now flows.



As soon as Time Switch cuts in, the heating element starts to heat water left in bottom of tank. When the temperature of this water reaches 82°C (180°F.) the thermostat cuts out, which as well as interrupting the electric supply activates the magnetic "Goyen" valve and water flows into the tank.



When temperature of water drops below 60°C (140°F.) due to cold water entering, the thermostat cuts in again and in addition to switching on the heating element, shuts off the magnetic inlet valve so that no more water can enter until the water in tank reaches 82°C (180°F.) again.



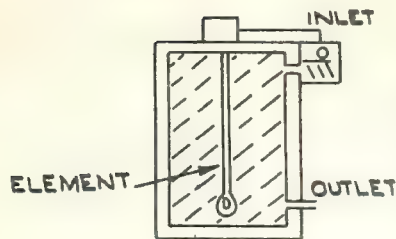
"Cycling" of thermostat continues to open and close magnetic water valve and connect and disconnect supply until tank is full of water at 82°C (180°F.) or heating period has expired.

MAGNETIC VALVE ON LINE
SIDE OF THERMOSTAT

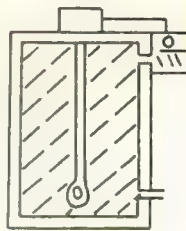
As soon as Time Switch cuts in the heating element starts to heat water and the inlet valve opens and admits water until the tank is full.

During heating cycle this tank behaves in same manner as the Displacement Type.

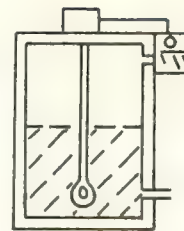
(This arrangement gives one (1) extra Hour of Heating as compared to "cycling" arrangement with the smaller sizes of tanks. Some small tanks have been altered to this arrangement.)

(c) RUN OFF (JOSEPH AUTO HOT) TYPE OF TANK.

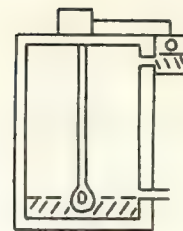
360 litres
(80 Gals.) of
Hot Water at
 82°C . (180°F .)



Approx. 122
litres (27 Gals.) of Hot Water at
 82°C (180°F .)
used - Tank now
full of Hot
Water at 63°C
(145°F .)



Approx. 122 litres
of Hot Water at
 82°C . (180°F .)
and 181 litres
(40 Gals.) of Hot
Water at 63°C .
(145°F .) used.
Tank now half full
of Hot Water at
 60°C (140°F .)



All hot water
used - no water
now flows.

When hot water is initially drawn off, the controller allows cold water to enter through inlet valve and mix with the hot water in the tank until the temperature has dropped to 63°C (145°F .) when the controller will completely cut off the water until supply has again been switched on by the Time Switch.

The re-heating cycle is as follows:-

At the cut-in of the time switch, the controller is holding the ball-valve closed. When the temperature of the water rises above 63°C (145°F .) the ball-valve is allowed to open slightly and cold water enters the heater at approximately the same rate at which it is heated. When the heater is full of water, the ball float is raised and the ball-valve closed. The electricity supply, however, remains "on" until the water is heated to 82°C (180°F .)

ITEM NO. 20 DEFECTS AND ACTION BY EMERGENCY SERVICE OFFICER

(a) Displacement Type Off-Peak Storage Water Heaters

The following checks shall be conducted on all heaters, except in the case of plumbing calls, before proceeding with the investigation of customer's report:

- (1) Time switch is operating at E.S.T.
- (2) Time switch settings.
- (3) Time switch is cutting in and out at settings when operated manually.
- (4) Loading of element as per kWh meter.
- (5) Read and note kWh meter readings on Service Report.

Customers' Report	Possible Cause	Action by Em.S.O.
(1) Cold water only. Not hot early in day or at any time since defect occurred.	(1) Defective time switch (2) Fuse blown or defective switch fuse (3) Defective S.C.C. contactor (where fitted) (4) Element O/C (5) Thermostat O/C (6) O/C in heater wiring or connections (7) O/C in switchboard wiring or connections	(1) Replace T/S Check R.P.M. etc. (2) If S/C wiring, refer contractor & E.I.S. If S/C tank, refer Sales Section. If circuit in order renew fuse, check R.P.M. etc. Advise hot water should be available next morning. If defective switchfuse, bridge & refer Sales Section. If defective E.L.C.B., bridge & refer to Contractor. (3) Bridge contactor. Refer M.S. same day or on week-ends, holidays etc., arrange for customer to switch off or Em.S.O. to follow up to switch off, if thermostatically controlled. (4) Isolate circuit, refer Sales Section (5) Isolate circuit & refer Sales Section (6) Isolate circuit, advise customer refer Sales Section. (7) Isolate, refer contractor if non-Council sale or to Sales Section if Council sale
(2) Water luke warm	(1) Defective time switch (2) Element 1/2 O.C. (3) Thermostat intermittent or large error and differential. (4) Intermittent O/C in heater wiring or connections.	(1) Replace T/S. Check R.P.M. etc. (2) Bridge T/S or relay, refer Sales Section. (3) Refer Sales Section. (4) Refer Sales Section.

(OVER)

Customers' Report	Possible Cause	Action by Em.S.O.
(2) (Cont'd) Water luke warm never hot	(5) Intermittent O/C in switch-board wiring or connections (6) Leaking heater, taps, or hot water pipes (7) Leaking taps	(5) Refer contractor if Non-Council sale or to Sales Section if Council sale. (6) Refer Sales Section. (7) Refer Sales Section if Council sale.
(3) Water hot some days, cold or lukewarm other days. Water cold after only small drain-offs some days.	(1) Intermittent time switch (2) Thermostat intermittent. (Inspect contacts if in doubt) (3) Intermittent O/C in heater wiring or connections. (4) Intermittent O/C in switch-board connection or wiring	(1) Replace T/S, check R.P.M. etc. (2) Refer Sales Section. (3) Refer Sales Section. (4) Refer contractor if non-Council sale or Sales Section if Council sale.
(4) Heater noisy. Rumbling, water very hot.	(1) Thermostat points frozen, or large error and small differential or set at maximum temperature.	(1) Isolate and refer Sales Section Code U.
(5) Dirty or rusty water from hot taps.	(1) Thermostat points frozen, or large error and small differential or set at maximum temperature. (2) Iron fitting in hot water pipe line.	(1) Isolate circuit and refer Sales Section Code U. (2) Isolate circuit. Refer Sales Section
(5a) Water boiling	(1) Thermostat points frozen, or large error and small differential, or set at maximum temperature.	(1) Isolate at main switch-board. Refer Sales Section Code U
(6) Heater noisy while hot water tap running or immediately after tap turned off.	(1) Ball valve vibrating or small dia. ball (2) Loose pipework.	(1) Refer Sales Section (2) Refer Sales Section.

Customers' Report	Possible Cause	Action by Em.S.O.
(7) Water cold first thing in morning, but warm or hot later in day.	(1) Time switch operating at incorrect time (2) Defective time switch (3) Switch tripping levers or studs loose, or incorrectly set.	(1) Correct time on T/S (2) Replace T/S (3) Adjust or replace T/S
(8) No flow of water from all taps at all times.	(1) Blockage at cold water feed, ball valve or pressure reducing valve. (2) Blockage in hot water main or airlock.	(1) Isolate circuit. Refer Sales Section. (2) Isolate circuit. Refer Sales Section. If airlock, clear by means of rubber hose between hot and cold water tap.
(9) Water cold later in day. Hot first thing in morning	(1) Check temp. of water at hot water tap. If not O.K., check heater as detailed in Report (1) (2) Leaking h.w. taps or pipes. (3) If O.K. question customer as to which days water runs cold, number of people, type of washing machine, etc. (4) If time switch is set for 7 hours heating, reset to 9 hours. (5) Take readings and refer Sales Section. (6) Leaking taps.	(2) Refer Sales Section. (6) Refer Sales Section.
(10) Water flowing from overflow or expansion pipe. Mornings only.	(1) Thermostat points frozen, or large error and small differential or set at maximum temperature. (2) Ball valve rubber washer worn or eroded	(1) Isolate circuit. Advise customer and suggest economy in use of water until Sales Section calls. Refer Sales Section. Code U (2) Refer Sales Section for attention by plumber
(11) Intermittent flow from all taps. On and off all day.	(1) Intermittent or partial blockage in cold water feed, ball valve, or pressure reducing valve (2) Intermittent blockage in hot water main (3) Defective tap washer or tap.	(1) Refer Sales Section (2) Refer Sales Section (3) Refer Sales Section.

(OVER)

Customers' Report	Possible Cause	Action by Em.S.O.
(12) No flow from one tap only.	(1) Defective tap washer or tap.	(1) Refer Sales Section.
(13) No flow from some taps but flow at other taps.	(1) Defective tap washers or taps. (2) Blockage in hot water line	(1) Refer Sales Section. (2) Refer Sales Section.
(14) Water flowing from overflow continuously, or intermittently throughout day.	(1) Ball valve or pressure reducing valve, stuck open (2) Leak in heater (usually dripping only)	(1) Isolate circuit. Turn off water. Refer Sales Section. (2) Isolate circuit. Turn off water. Refer Sales Section.
(15) Hot water tap dripping.	(1) Defective tap washer	(1) Refer Sales Section.

(b) Falling Level Type - Off-Peak Storage Water Heaters

The following checks shall be conducted on all heaters, except in the case of plumbing calls, before proceeding with the investigation of defect, of customer's report:

- (1) Time switch is operating at E.S.T.
- (2) Time switch settings.
- (3) Time switch is cutting in and out at settings when operated manually.
- (4) Loading of element as per kWh meter.
- (5) Read and note kWh meter readings on Service Report.

Customers' Report	Possible Cause	Action by Em.S.O.
(1) No flow of water from all taps at all times.	<ol style="list-style-type: none"> (1) Defective time switch (2) Fuse blown, or defective switch fuse. (3) Element, heater or switchboard wiring and connections O/C. (Where magnetic valve is cycling, or on "Joseph" and "Simplex" heaters where controllers are operating cold water supply.) (4) Thermostat points frozen where magnetic valve is cycling. (5) Thermal unit on controller has lost charge or mercury switch permanently closed. (6) Defective magnetic valve:- (a) Plunger not lifting (b) Energising coil O/C (c) O/C in wiring to energising coil. 	<ol style="list-style-type: none"> (1) Replace T/S. (2) If S/C wiring, refer contractor & E.I.S. If S/C tank, refer Sales Section. If circuit in order, renew fuse, check R.P.M., etc. Advice customer hot water should be available next morning. If defective switch fuse, bridge & refer Sales Section. If defective E.L.C.B., bridge and refer to contractor. (3) Isolate circuit & refer Sales Section. (4) Isolate circuit and refer Sales Section. Code U. (5) Isolate circuit and refer Sales Section. Code U. (6) (a) <u>Water not entering heater:</u> Invert valve and pull out plug. If water enters heater, bridge time-switch. If water will not enter heater, isolate circuit, treat as urgent & refer to Sales Section. Code U. (b) Bridge out time-switch or relay, and (c) Bridge out time-switch or relay

(OVER)

Customers' Report	Possible Cause	Action by Em.S.O.
(1) (Cont'd) No flow of water from all taps at all times.	(7) Controller or stirrup out of adjustment on Joseph or Simplex heaters. (8) Blockage in cold water feed, ball valve, restrictor or "Simplex" controller (9) Blockage in hot water line or airlock.	(7) Adjust to allow water to flow continuously. Refer Sales Section. Code U. (8) Isolate circuit and refer Sales Section. (9) Isolate circuit and refer Sales Section. If airlock, clear by means of rubber hose between hot and cold water taps.
(2) Water cold or luke warm later in day, but hot first thing in morning	(1) Time switch operating at incorrect time where the magnetic valve is across line. (2) Magnetic valve plunger stuck in open position. (3) Controller or stirrup out of adjustment on "Joseph" or "Simplex" heaters	(1) Correct time on T/S. (2) (a) <u>Water not entering Heater:</u> Invert valve and pull out plug. If water enters heater, bridge time-switch. If water will not enter heater, treat as urgent, isolate supply and refer to Sales Section. (b) <u>Water entering heater continuously:</u> Bridge out time-switch or relay. (3) Adjust to allow water to flow continuously. Refer Sales Section.
(3) Flow of hot water satisfactory in morning but ceases in afternoon	(1) Element 1/2 O/C where M.V. is cycling. (2) Thermostat points intermittently, freezing together. (Inspect contacts if in doubt) (3) Defective magnetic valve:- (a) Plunger intermittently not lifting (b) Plunger creeping downwards.	(1) Bridge T/S or relay, refer Sales Section. (2) Invert magnetic valve. Refer Sales Section. Code U. (3) (a) <u>Water not entering heater</u> Invert valve and pull out plug. If water enters heater bridge time-switch. If water will not enter heater, treat as urgent, isolate supply & refer to Sales Section. (b) <u>Water entering heater continuously</u> Bridge out time-switch or relay.

Customers' Report	Possible Cause	Action by Em.S.O.
	<p>(4) Ball valve or restrictor partly blocked. Holes in vertical restrictor should be 1½" to 2" below water level.</p> <p>(5) Intermittent or partial O/C in heater wiring.</p> <p>(6) Intermittent or partial O/C in switchboard wiring.</p> <p>(7) If intermittent or partial open circuit main switch fuse for Rate "A"</p> <p>(8) If time switch is set for 7 hours reset to 9 hours.</p> <p>(9) If time switch is set for 9 hours:-</p> <p>(a) If questioning of customer, and kWh consumption do not indicate full capacity of heater is being used, time switch is defective. Replace T/S.</p> <p>(b) If customer complains that water occasionally ceases to flow easily after small draw-off, time switch is possibly defective. Replace T/S</p> <p>(c) If not (a) or (b) and kWh consumption indicates that full capacity of heater is being used, advise customer.</p>	<p>(4) Refer Sales Section.</p> <p>(5) Refer Sales Section.</p> <p>(6) Adjust or refer to contractor.</p> <p>(7) Adjust or refer to Sales Section.</p> <p>(9) (c) Advise customer and suggest economy in use of water until Sales Section calls. Refer Sales Section.</p>
(4) Water lukewarm. Never hot	<p>(1) Intermittent time switch</p> <p>(2) Element 1/2 O/C where M.V. is connected across the line.</p> <p>(3) Thermostat intermittent in operation, or large error where magnetic valve is connected across the line.</p>	<p>(1) Replace T/S</p> <p>(2) Bridge T/S or relay, refer Sales Section</p> <p>(3) Invert magnetic valve. Refer Sales Section. Code U.</p>

Customers' Report	Possible Cause	Action by Em.S.O.
(4) (Cont'd) Water luke-warm. Never hot.	(4) Controller out of adjustment on "Joseph" or "Simplex" heater. (5) Intermittent O/C in heater wiring or connections. (6) Intermittent O/C in switch-board wiring or connections.	(4) Adjust to allow water to flow continuously. Refer Sales Section. (5) Refer Sales Section. (6) Adjust or refer to contractor.
(5) Water always cold	When magnetic valve is connected across line - (1) Element O/C (2) Thermostat O/C	(1) Refer Sales Section (2) Isolate circuit. Refer Sales Section. Code U.
(6) Heater noisy. Rumbling water very hot.	(1) Thermostat points frozen or large error and small differential. (2) Thermal unit has lost charge on Joseph and pre-war Simplex heaters.	(1) Magnetic valve type heater Isolate, treat as urgent, and refer to Sales Section. Code U. (2) Non-magnetic valve type heater. Isolate, treat as urgent, refer Sales Section. Code U.
(7) Dirty or rusty water from hot water taps.	(1) Thermostat points frozen or large error and small differential. (2) Thermal unit has lost charge on "Joseph" and pre-war "Simplex" heaters. (3) Iron fitting in hot water pipe line	(1) Isolate circuit and refer Sales Section. Code U. (2) Isolate circuit and refer Sales Section. Code U. (3) Isolate circuit and refer Sales Section. Code U.
(8) Water cold first thing in morning, warm or hot later in day	(1) Time switch operating at incorrect time. (2) Defective time switch (3) Switch tripping levers or studs loose or incorrectly set.	(1) Correct time. (2) Replace T/S. (3) Adjust or replace T/S.
(9) Water flowing from overflow. Mornings only	(1) Thermostat points frozen or large error and small differential. (2) Thermal unit has lost charge on "Joseph" and "Simplex" heaters.	(1) Isolate circuit, treat as urgent, refer Sales Section. Code U. (2) Isolate circuit, treat as urgent, refer Sales Section. Code U.
(10) No flow from one tap only.	(1) Defective tap washer or tap (2) Airlock	(1) Refer Sales Section (2) Clear by means of rubber hose between hot and cold water taps. If not successful refer Sales Section.

Customers' Report	Possible Cause	Action by Em.S.O.
(11) No flow from some taps but flow at other taps	(1) Defective tap washers on taps. (2) Airlock (3) Block in hot water line	(1) Refer Sales Section (2) Clear by means of rubber hose between hot and cold taps. If not successful, refer Sales Section. (3) Refer Sales Section
(12) Water flowing from overflow continuously or intermittently throughout day.	(1) Ball valve stuck open (2) Leak in heater. Usually dripping only	(1) Isolate circuit and refer Sales Section (2) Isolate circuit and refer Sales Section
(13) Hot water tap dripping.	(1) Defective tap washer	(1) Refer Sales Section.

Item 20

C. MAINS PRESSURE AND REDUCED PRESSURE HEATERS -

If a time switch or relay fails to operate at an "off" position, or signal, and the thermostat and thermal cut-out are faulty in setting or operation, the following hazards can arise:-

With a 200 lb relief valve, the temperature will rise to almost 186°C (400°F.) The relief valve only takes care of expansion of water through a vent pipe to the atmosphere and is not acceptable as a back-up safety device to the thermostat or thermal cut-out.

With electricity on continuously, the valve cannot be relied on to discharge or dissipate energy at a sufficient rate to prevent an explosive build up of energy within the tank, and at temperatures from 158°C. (350°F.) upwards, hot water soldered pipe joints may break. Should the tank fail under these conditions, the energy stored will be released with explosive force.

Water stored at high temperature turns to steam immediately a hot water tap is turned on and the pressure released. Under these conditions the relief valve may also exhaust steam, although not in sufficient quantity to prevent energy build-up in tank.

Either of these conditions indicate that the thermostat has failed to cut out and the thermal cut-out is either inoperative or one has not been fitted.

Procedure

Under no circumstances shall a thermostat or a thermal cut-out on an unvented heater be removed or bridged. (This includes 113 litre (25 gall.) tanks, with top and bottom elements controlled by separate thermostats and thermal cut-outs.

Time switch settings shall not be reduced, but the electrical circuit controlling hot water systems shall be left disconnected, the job treated as urgent and referred to Apparatus Service for replacement of defective thermostat or thermal cut-out.

Where thermal cut-outs have not been fitted on mains pressure or reduced pressure tanks, customers will be referred by the Emergency Service Officer to the manufacturer to have same fitted, and the Em.S.O. is to refer the job to the Apparatus Service Section because of no thermal cut-out existing.

MAINS PRESSURE DISPLACEMENT HEATER

Usually connected direct to cold water mains. In very high pressure areas, connection may be through a ratio valve (reduce heater pressure to $\frac{1}{2}$ mains.)

Typical Nameplate

Swiftsure
Ser.....G.....W.....V.....
Floor mounting type.....
Maximum Working Head 150 P.S.I.

Note; Max. Working Pressure
100 p.s.i. or over
(usually 125-200)

OVER TEMPERATURE PROTECTION

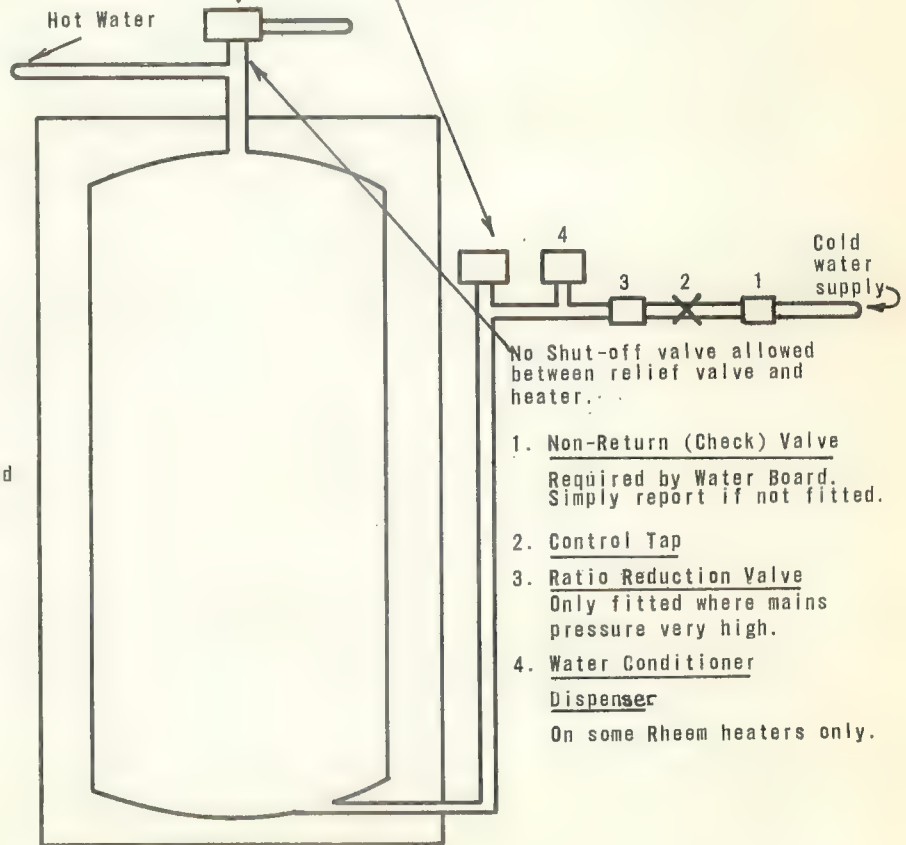
- All elements must have over temperature cut-out (T.C.O.) as well as thermostat.
- T.C.O. should not activate a contactor.
- T.C.O. may be separate or in-built into thermostat.
- Thermostat with in-built T.C.O. are marked; -
'Cut-out Temperature (usually 205) °F'.
- 'Maclaren' stem type thermostat with T.C.O. marked 'T.C.O. 9' or 'T.C.O. 11' (numbers give stem length)
- Separate T.C.O. in series with thermostat usually has a reset device
- Single pole controls must be in active.
(Always Check)

Pressure Relief Valve (alternate positions)

Note; Isolate if not fitted

Relief Drain

- must be copper to the 1st air break
- to check if not blocked, disconnect at valve and blow through.



1. Non-Return (Check) Valve
Required by Water Board.
Simply report if not fitted.
2. Control Tap
3. Ratio Reduction Valve
Only fitted where mains pressure very high.
4. Water Conditioner Dispenser
On some Rheem heaters only.

Modern Metric Specifications are:-

Maximum Working Pressure between

-850-1400 kPa
(1000 kPa average)

T.C.O. setting - 85°C

VALVE CONTROLLED (REDUCED PRESSURE) WITH BUILT IN VALVES

Typical Nameplate

SWIFTSURE
Ser.....G.....W.....V.....
Floor mounting Type.....
Maximum Working Head 15 p.s.i.

Nameplate Maximum Working Pressure
Under 100 p.s.i. (usually 9-30)

Pressure Relief Valve

Relief Drain

- must be copper to 1st air break
- to check not blocked, disconnect at valve and blow through

OVER TEMPERATURE PROTECTION

- All elements must have over temperature cut-out (T.C.O.) fitted as well as a thermostat.
- T.C.O. should not activate a contactor.
- T.C.O. may be separate or in-built into thermostat.
- Thermostat with in-built T.C.O. are marked;-
 - 'Cut-out temperature (usually 205) °F'
- Maclaren stem type thermostat with T.C.O. marked 'T.C.O.9' or 'T.C.O.11' (numbers give stem length)
- Separate T.C.O. in-series with thermostat usually has reset.
- Single pole controls must be in Active- always check.

Pressure reduction valve.

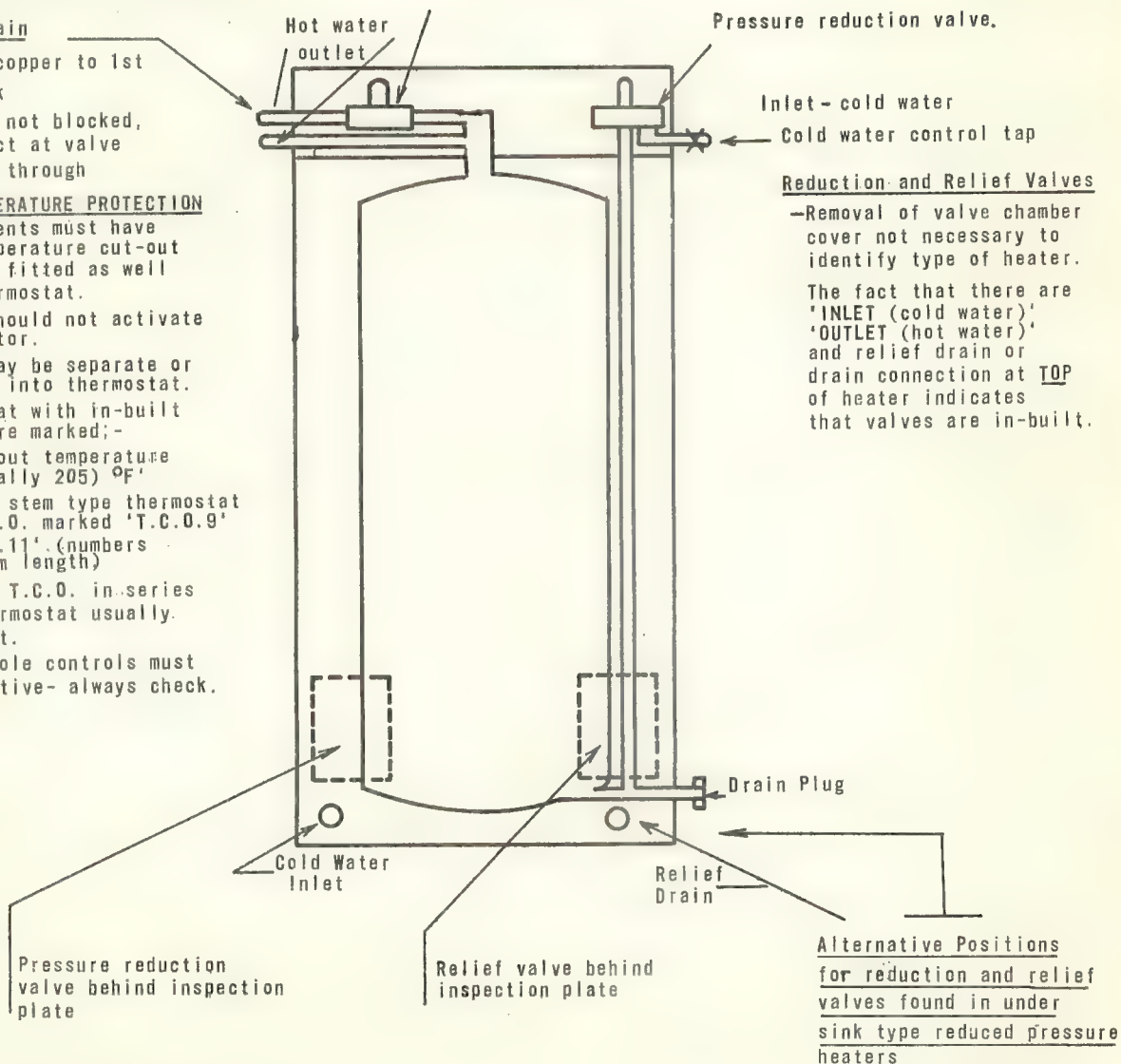
Inlet - cold water

Cold water control tap

Reduction and Relief Valves

- Removal of valve chamber cover not necessary to identify type of heater.

The fact that there are 'INLET (cold water)', 'OUTLET (hot water)', and relief drain or drain connection at TOP of heater indicates that valves are in-built.



Modern Metric Specifications are:-

Maximum Working Pressure
-60-250 kPa

T.C.O. Setting
-85°C

(e.g. 'Langco')

Item 20 (Cont.)

D. EXCESS USAGE OF HOT WATER OR TANKS OVERFLOWING DUE TO FAULTY VALVES IN DISHWASHERS AND WASHING MACHINES

Faulty valves in either dishwashers or washing machines can cause excess use of hot water, particularly in automatic washing machines where hot water can be used inadvertently for rinsing owing to valves becoming defective.

After checking to ascertain that this is the fault, refer to manufacturer.

If the hot and cold taps controlling flow of water to dishwashers or washing machines are left open when these machines are not in use, and a valve fault develops it is possible for cold water to be forced back along the hot water lines to the hot water tank causing water to flow from the overflow pipes.

ExamplesDisplacement type tank (top feed)

Cold water flows through the hot water pipes and discharges from the vent pipe into the feed tank, this allows it to overflow into the drip tray and is taken outside through overflow pipe.

Displacement type tank (side feed)

Cold water is forced through hot water pipes and discharges into the main hot water tank, this allows the hot and cold water to mix and hot water is pushed into the side feed tank which overflows into the drip tray.

Falling level type tank

Cold water is forced through hot pipes into the main hot water tank and would mix with hotwater until tank becomes filled. Water would be then discharged into the feed tank and drip tray. Customers could receive hot water at various temperatures gradually decreasing in temperature until all water in tank becomes cold.

Mains pressure and reduced pressure tanks

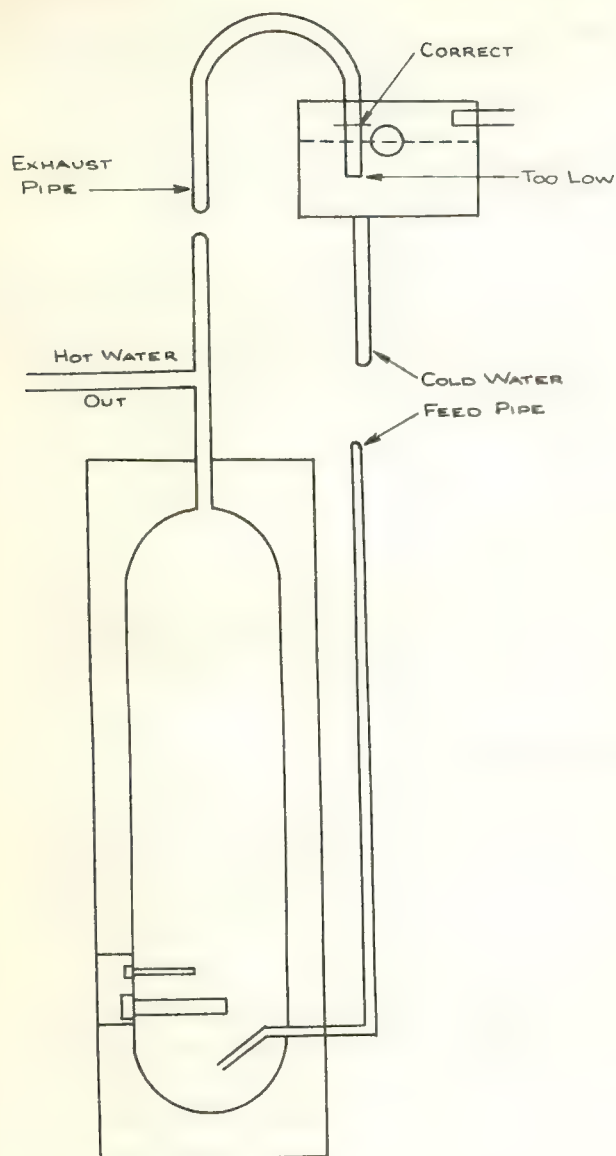
With these types of tanks cold water would be forced back along hot water pipe lines and could be forced back past the pressure relief valve and out through the overflow pipe, under these circumstances the relief valve would not necessarily be defective.

Action

In all cases isolate washing machine or dishwasher at hot and cold taps.

If water ceases to flow back to tank, refer to manufacturer.

Item 20 (Cont'd.)

Floor model displacement tank

An unusual fault with this model tank. Water is hot first thing in the morning, but by approximately 10.00a.m. water becomes luke warm.

Cause

Exhaust pipe is set too low in the ceiling causing water to syphon from the feed tank mixing hot and cold water together.

Action

Re-position outlet of exhaust pipe above the water level in the feed tank.

E. ACTION TO BE TAKEN WITH CERTAIN FAULTS ON
EXTENDED OFF PEAK WATER HEATERS

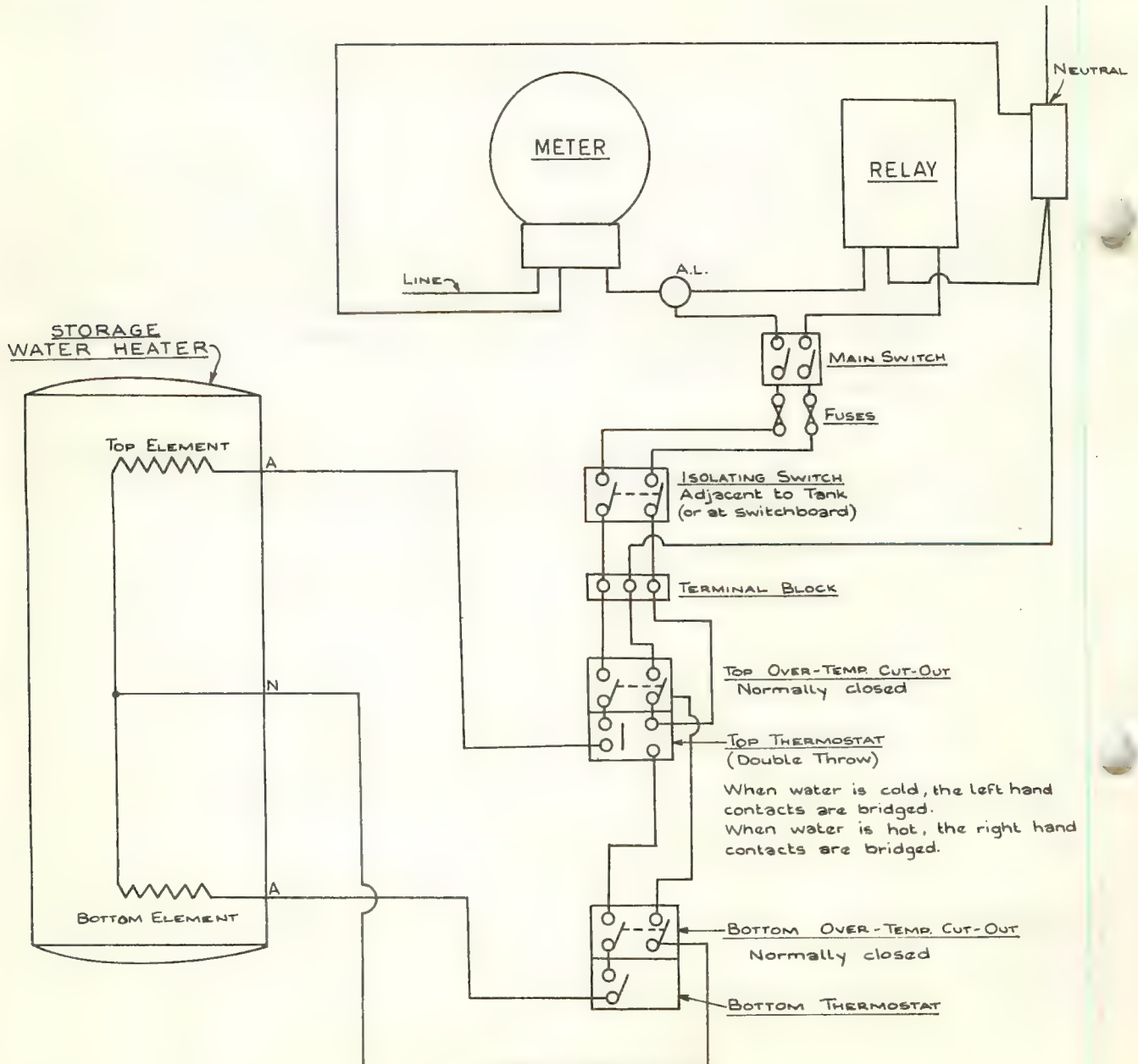
1. Fault: Open circuit top element or bottom element.
Action: Refer job to Sales Section and code 5(K)U top or bottom.
2. Fault: Top or bottom oven-temperature cut-out open.
Action: This condition would result in the neutral from both elements being open circuited so no heating would take place. These cut-outs must not be bridged. Isolate the heater and refer the job to the Sales Section; code 5(q)U.
3. Fault: Top or bottom thermostat defective.
Action: Isolate the circuit and refer to the Sales Section code 5(q)U.

A complaint of cold water (after a considerable use of hot water) in the period when the Zellweger relay or time switch is open, namely between 5.00 p.m. and say 10.00 p.m. could result from another fault other than those listed above. If on check, the circuit appears to be satisfactory, it is possible that the active connections to the two elements may be reversed. This would put the top element active through the relay or time switch instead of the bottom element.

With this arrangement, the only time when the top element, which is designed to give a rapid heating of water adjacent to the draw off point, can be heated is when the relay or time switch is closed.

Action: Reverse circuits and refer to E.I.S. code N.

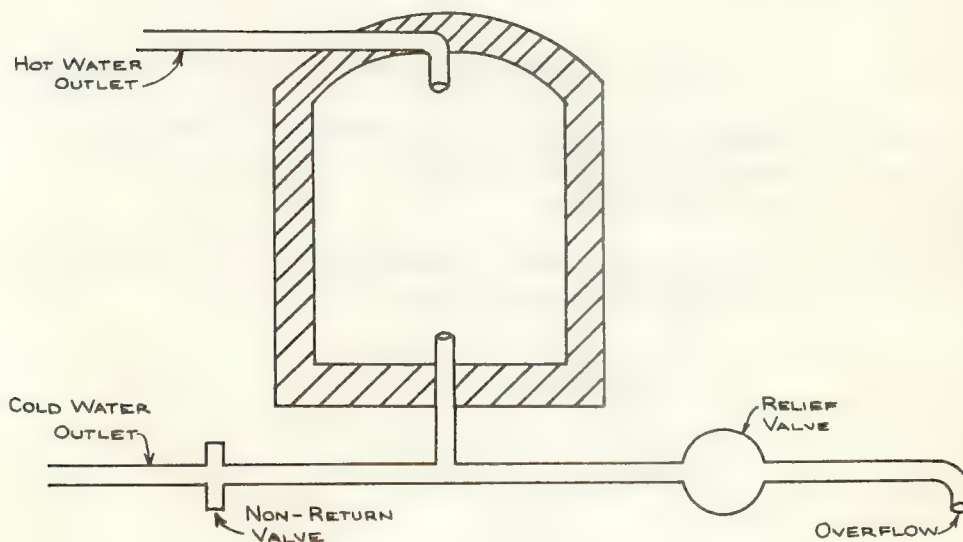
DIAGRAM ILLUSTRATING THE OPERATION OF THE 113 LITRE
(25 GALLON) EXTENDED OFF PEAK WATER HEATER



Item No. 21

I. DUX MAINS PRESSURE WATER HEATERS AND SIMILAR MAKES OF HEATERS

The expansion of water in any type of heater is one part in twenty-three when water temperature rises through 38°C (100°F.) e.g. a 113 litre (twenty-five gallon) heater would displace approximately $4\frac{1}{2}$ litres (one gallon) of "expansion" water when heated from 21°C (70°F.) to 76°C . (170°F.)

SKETCH OF HEATER

In blocks of flats or units where heaters of this type are installed, it is quite common for varying amounts of water to be discharged from the overflow pipe which could result in worried enquiries from customers.

Note: In new installations, it is not uncommon for the overflow pipe to be blocked by builder's debris, e.g. concrete, so that no overflow occurs.

The reasons for the variations of overflow is that although the design provides for water to be forced past the relief valve and out the overflow pipe as the water expands with rise in temperature, in practice it is found that if the relief valve is set to operate at a higher pressure than the mains pressure, water can be forced back past the non-return valve into the cold water pipe.

It can be readily understood that no two valves would be set exactly the same, so while one tank's overflow might run quite freely, another could produce only a slight trickle. In either case the tank is quite safe.

The technical adviser of "Dux Heaters" has stated that even when no flow occurred at the overflow outlet, the tank could still be safe as the condition could exist that all of the "expansion" water is being forced back past the non-return valve into the cold water pipe.

Note: As hot water is thus forced back past the non-return valve, expansion of metal can cause the non-return valve to jam in a closed position with a resultant complaint of "No flow from hot water taps".

To free valve, open one hot water tap and then give the non-return valve a slight tap on top with pliers which usually will free valve.

If unable to free, isolate heater and refer to Sales Section.

These mains pressure tanks must be protected by a thermal cut-out as well as a thermostat. In some cases, the thermal cut-out may be incorporated with the thermostat.

Under no circumstances may these thermal cutouts or thermostats be bridged out by Emergency Service Officers.

(II) LANGCO MAINS PRESSURE HOT WATER SYSTEM "SUPER 60"

The Langco Mains Pressure Off Peak Hot Water System "Super 60" is fitted with a booster element as shown in the attached diagram.

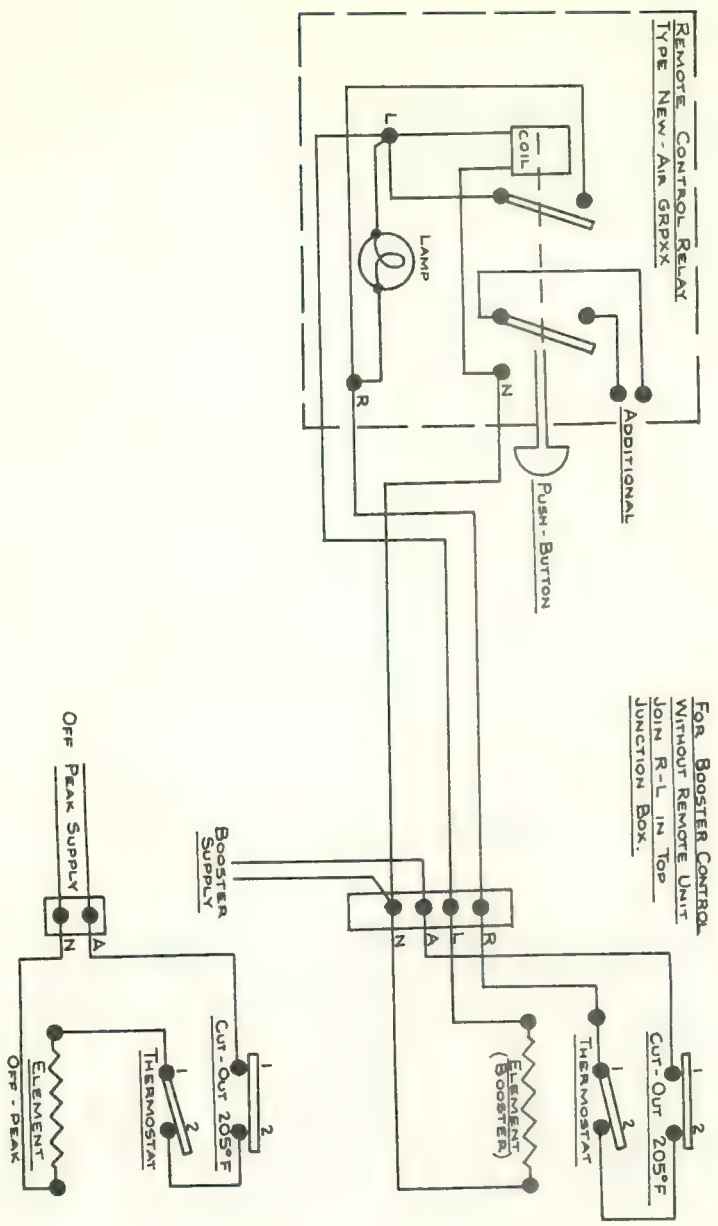
A remote control is operated by a push button which the customer can operate from a selected position. This control should be constantly visible to enable the indicating light to be noticed when the thermostat on the booster element closes. This thermostat for the top element is usually set at from 60°C (140°F.) to 65°C (150°F.)

This is an indication that approximately 68 litres (15 gallons) of water remains at 63°C (145°F.) and, if not sufficient for future requirements that day, the remote control push button may be operated by the customer to ensure a continuance of hot water.

Note: When the time switch or ripple control closes the relay, the light may show for a period owing to cold water circulation. At this time, the customer should not close relay by pushing the control button, as this could result in excess accounts on the general rate on which the booster element is connected.

"Rheem" also make a similar tank which operates on the same principle as the Langco "Super 60".

LANGCO MAINS PRESSURE HOT WATER SYSTEM "SUPER 60"



ITEM NO. 22 - JOSEPH FALLING LEVEL TANKS WITH THERMO-SIPHON
WATER CIRCULATION

These types of tanks are used in dormitory type of buildings and a water circulator is essential to avoid excess cold water run-offs, giving greater economy in hot water usage. A water circulator would not be satisfactory in a high rise building.

The large mains falling level tank is housed in the ceiling or on the roof and supplies numerous outlets on the floors below, at a suitable position at the lowest point of the circulatory system a thermo-siphon water circulator is incorporated.

This small tank has a 2.4 kW element which operates continuously on the applicable general supply rate.

In circuit with the element, a thermostat set at 88°C (190°F.) and a thermal cutout are connected for water temperature control.

Cooling of water at outlets located away from the main tank could denote open circuit to element, thermostat or thermal cutout in the recirculating tank.

ITEM NO. 23 - FALLING LEVEL JOSEPH TANK PRESSURISED BY
CENTRIFUGAL PUMP

These types of tanks are used by large organisations and institutions such as hospitals, convents, squash centres and aged person's home units, and may be installed in the basement or in the ceilings of these buildings.

Where two or more tanks are used to increase capacity the plumbing installations from these heaters are paralleled on both the hot water outlet from the tank and the return to tank (see attached sketch of single tank). The hot water is pressurised by a 1 HP centrifugal pump which runs continuously recirculating the hot water back into the tanks.

In the event of a large capacity draw-off of hot water and the water level drops to the level at which the float switch is installed in the tank above the hot water outlet pipes, this switch will open and de-energise the coil on the contactor controlling the motor pump. Without the pump operating, the water to all outlets is reduced to a small

ITEM NO. 23 (CONT'D.)

gravity flow when tanks are installed in the roof, and where tanks are installed at floor level, the hot water flow ceases.

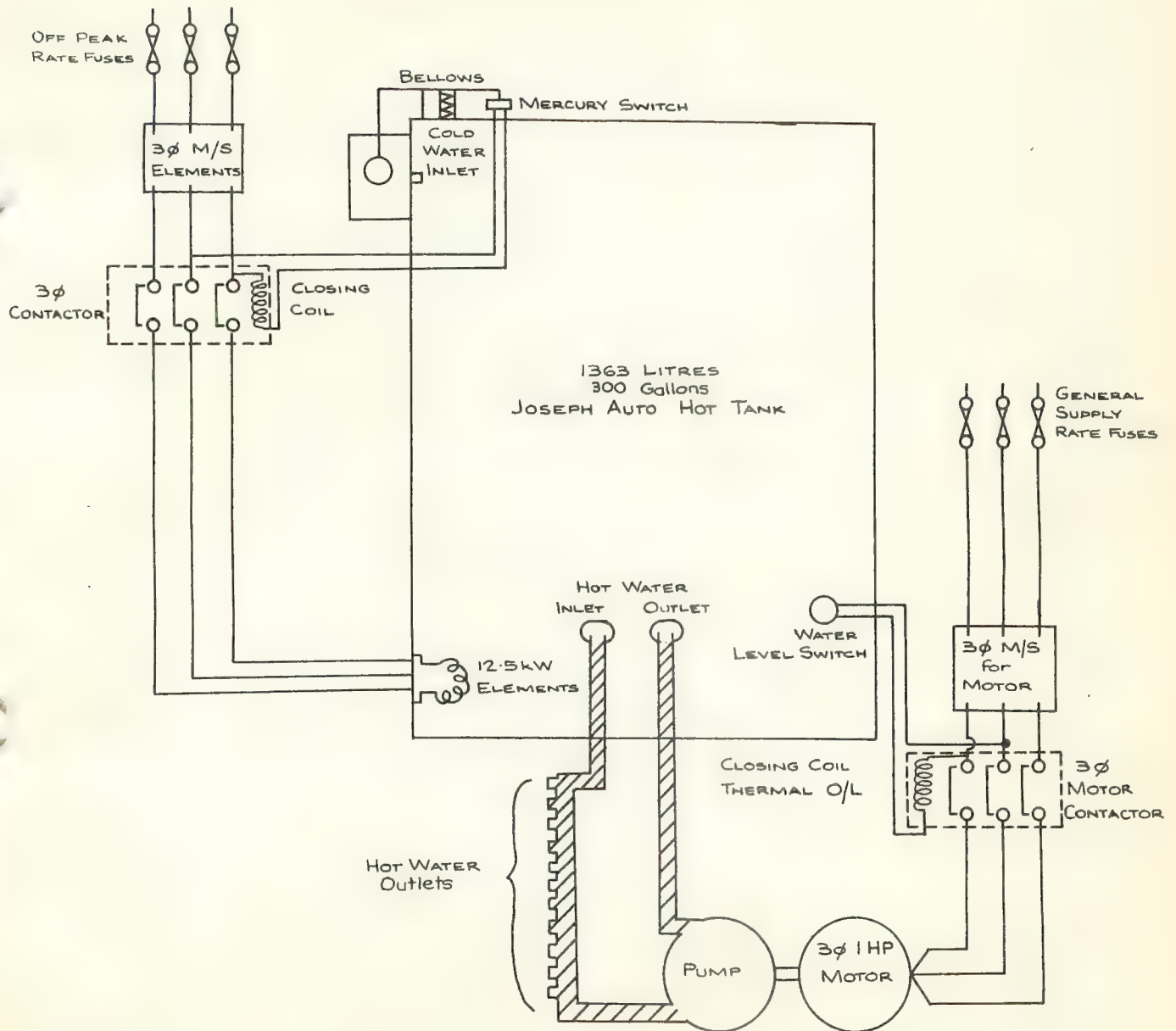
Where two or more tanks are paralleled and a failure occurs on one tank requiring same to be emptied and isolated, it would be necessary to bridge the water level switch on the defective tank as the water level switches to all tanks are wired in series.

Attached is a diagram of a single tank showing circuit diagram for off peak element circuit, general supply rate motor circuit, and hot water plumbing from tank to centrifugal pump installed at lowest point.

In some earlier model tanks, each tank had its own individual centrifugal pump even though the dual tanks are married into a common system.

For example at St. Lukes Hospital Roslyn St., Elizabeth Bay, it was found that one pump was sufficient to maintain water pressure, so a changeover switch has been installed on the switchboard adjacent to the tanks thus enabling the pumps to be isolated or used alternately.

SKETCH OF FALLING LEVEL JOSEPH TANK



A.T.M. RHYTHMATIC CONTROL AND ZELLWEGER FREQUENCY INJECTION EQUIPMENT USED FOR STORAGE WATER HEATER INSTALLATIONS.1. A.T.M. RHYTHMATIC CONTROL

This system employs an audio frequency current which is applied to the 11 kV network. The signal passes through this network and is stepped down through the 11 kV/415-240V distribution transformers; it then passes through the low voltage network to actuate relays installed at customers' premises.

The relays are tuned to operate at the control frequency and for a particular pulse rate or rhythm. The system provides for the transmission of different rhythms or signals as listed on attached chart.

The Zellweger frequency injection equipments which are being installed in the zone substations in the Bankstown Municipality are being arranged to transmit the A.T.M. as well as the Zellweger programmes and thus operate either A.T.M. or Zellweger relays in customers' premises. The existing A.T.M. relays at customers' premises in the Bankstown area will remain in use for a considerable number of years.

The Nos. 1, 2, 8, 9, 15, 16, 21 and 22 channels of the Bankstown area frequency injection equipment are being used for the A.T.M. system, while the remaining channels are used for the Zellweger system, giving 14 Zellweger channels and 8 A.T.M. channels.

While the Zellweger relays connected will be subject to switching off as in other zones, the A.T.M. relays will not normally be affected after being manually closed. However, as the injection equipment may be subject to test runs at any time, which would cause A.T.M. relays in the field to open after being manually closed, officers will now treat A.T.M. relays in the same manner as Zellweger relays.

To remove the front cover, first break seal on front cover etc. and then unscrew the three covers holding screws. These covers are fitted with a plastic dust seal which may adhere to the base, making the cover difficult to remove. If use of tools necessary, use edge of knife to free cover - extreme care must be exercised. Should the knife slip, the cover and the internal mechanism may be damaged.

Replace cover; fasten and seal according to B.S.I. 3113.

When reporting rhythmic controls as defective, always give the A.T.M. number and the rhythm cycle.

2. ZELLWEGER FREQUENCY INJECTION EQUIPMENT(i) Installation on S.C.C. System

Zellweger frequency injection equipment has been installed in all zones for the control of off-peak water heaters, space heaters, etc.

In general, ripple control transmitting units have been installed in most zone substations and each frequency injection unit is individually controlled by a separate H.V. feeder panel at the zone substation or, alternatively, is tee-connected to the zone transformer 11 kV terminals and controlled by a tripping-type fuse switch unit. There is one transmitting unit for each load group.

(ii) Principle of Operation

At each zone substation at which the transmitting units are installed, there are two audio-frequency motor generator sets provided to produce the 750 cycles per second voltage required for the operation of the system. For each transmission, the transmitter produces an audio frequency (750V) impulse-programme in accordance with the setting of the channel control switches at that particular time.

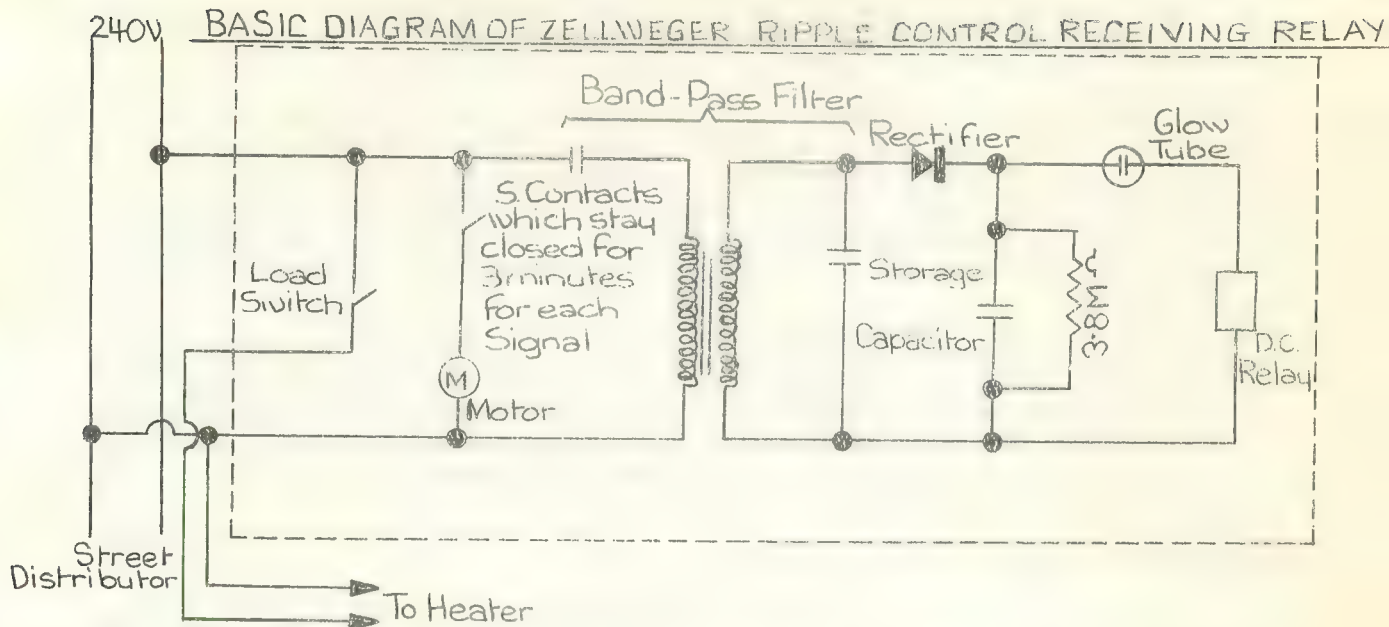
During each transmission, 750 cycles per second voltage is superimposed on the network voltage in accordance with the settings of channel control switches. Each complete transmission takes approximately three minutes.

During the initial period (first 5 seconds approximately) of the transmission, and after the M.G. sets are up to speed, the 750 c.p.s. signal is sent out to receiving relays installed in premises supplied from the associated zone transformer. This initial signal causes the synchronous motor in all the receiving relays to start and they all run for the same three-minute period as, and in time with, the coding device on the programme controller.

This operation should not have any adverse harmonic effects on radio, television, etc. but in the event of such occurring, it would be because of possible defects in radio or television sets. Emergency Service Officers will not make comment or refer customers to radio or television technicians, but advise customers that they will report same for attention. Code the job 6(-)N and make message X on daily run sheet and state nature of fault.

The telephone-type D.C. relay in each of the receiving relays is supplied via a 750 c.p.s. band-pass filter circuit, a step-up transformer, and through a rectifier and glow tube. Firing of the glow tube is by a charge built up on a parallel connected storage capacitor, thus ensuring a positive action. (See basic diagram over).

Frequency Injection Equipment (Cont'd.)



Each receiving relay has a switching drum which makes one complete revolution during the three-minute period. Fitted to this drum is a switching cam which can be adjusted to any one of 22 positions.

The programme controller is so arranged that the audio frequency is either injected or not injected during any of 22 seven-second periods. Twenty-two on/off channel control switches are fitted on the programme controller to provide selection of the desired injection periods. The impulse contactors therefore close and remain closed for a period of seven seconds for each "on" command. This is in contrast to the Rhythmic system used in the Bankstown area in which impulses are transmitted at various specific pulse rates and cause oscillation of pendulum-type operating mechanisms in the receiving relays.

A customer's receiving relay will only switch "on" if an injection signal is received at the same time as its switching cam approaches the switch lever. If a signal is not received at this time, then the cam will by-pass the "on" lever and either confirm that the switch is in the "off" position, or switch it off if it was already "on". Hence, during each transmission, i.e. each time the relays are started, all relays will be switched "off" unless a signal is received at the time interval corresponding to their switching cam position.

The first switching on signal for off-peak water heaters will commence at 8.00 p.m. and others will follow at 9.00 p.m., 10.00 p.m., 10.30 p.m., 11.00 p.m., midnight and 1.00 a.m.; the channel setting for each customer being set as near as practicable to the time switch setting which had been in use at the premises prior to the installation of the Zellweger relay.

Frequency Injection Equipment (Cont'd.)

The heating period for heaters will be between 6 and 10 hours; that is all Rate "A" tanks (previously switched on between 8.00 p.m. and 11.00 p.m.) will be progressively switched off between 6.00 a.m. and 8.00 a.m.

Also, during each transmission, any commands that have been sent out previously are again sent out, i.e. any "on" signals sent out at say, 10.00 p.m., would again be sent out in conjunction with 11.00 p.m. signals. Similarly for "off" signals at say, 7.00 a.m. and 8.00 a.m. Thus each transmission confirms the previous "on" or "off" command on that channel.

A total of approximately 28 "on" and "off" commands during each 24 hour period are sent out. Because many of these times coincide (e.g. all space heaters switched off at the same time as some water heaters), every injection unit and customer's receiving relay connected to this system will start up and run approximately 15 times a day.

3. PROCEDURE TO BE FOLLOWED BY Em.S.Os.

It will now be permissible for Emergency Service Officers to open the top covers of the customer's receiving relays but they must not alter the programme dial located in the top left corner of the relays. These will be set by Meter Branch personnel before installation and don't require alteration.

Policy to date has stated that if a ripple control relay is suspected of being faulty, it may be bridged by removal of the terminal cover and moving the load conductor into the tunnel of the active terminal of the relay and tightening the screw on to the two conductors. This policy will now be altered due to a poor history of accidents associated with bridging relays. The following procedures will now be used:-

(i) Testing of Controlled Circuit

Wipe dust from cover, remove seal and main cover (see safety note below) and operate toggle switch manually (2 or 3 toggles in the case of multipole relays). Where no fault in the controlled load circuitry is evident, the load will be switched off, the cover and seals replaced and the customer informed that the defect has been corrected (if applicable). When replacing the cover of a three phase relay, it is necessary to ensure that the programme dials are visible, i.e. the cover is the correct way up.

(ii) Bridging Relay

When Emergency Service Officers want to make uncontrolled supply available to a water heater, the following steps will be taken:

Procedure to be Followed by Em.S.Os. (Cont'd.)

Wipe dust from cover, remove seals, main cover and terminal cover. Inspect for signs of overheating in the load carrying circuit and if satisfactory, manually operate the toggle switch or switches and remove the neutral conductor from the relay to prevent the relay switching "off" on the next injection programme. Insulate neutral conductor, replace cover and seals.

When one three phase relay is used for 2 or 3 flats and the neutral is removed from the relay, the other flats must be left cut in. Where a large number of tanks are involved, permission must first be obtained from the System Operator (B.S.I. 5109).

If the relay appears defective and it is necessary to bypass the load switch, the load conductor may be moved into the line terminal if the conductor size and condition of the terminal permit. If this procedure is not practical, then active and load conductors will be joined by the use of two screw tunnel type connectors. Binding wire must not be removed from the conductors, neither shall conductors be bound or twisted together.

A luggage label must be attached, signed, and dated giving reason for bridging and addressed to O.E., E.D.S., or M.S., whichever is applicable, to remove bridge and reconnect relay at following visit.

Examples:

- (1) An Emergency Service Officer attending a Code 6 call and finds by inquiry that excess water has been used by tap left on, extra persons in home, fuse deterioration, M.S. off or like reasons and no other defect, will not bridge relay and will inform customer that the defect has been corrected (if applicable) and that hot water will be available on the next day. If necessary he can inform the customer that he is not permitted to bridge a relay unless it is faulty.
- (2) Emergency Service Officers, on finding defects to tank such as element half O.C., defective switch fuse (bridged), magnetic valve defective (inverted) and like defects, will bridge the relay and code back the applicable code such as 5(k)N; 5(t)N; or 5(n)N etc. The luggage label in this case would be addressed to E.D.S. If the thermostat is defective, the relay will not be bridged but the circuit will be isolated and the job coded back (5(q)U.
- (3) An Emergency Service Officer who is sure that the relay is faulty would leave the relay bridged and code back 6(1)N for replacement of relay by Meter Branch.

Procedure to be Followed by Em.S.Os. (Cont'd.)

- (4) If the officer attending cannot find any defect in the off-peak circuit after bridging to check the meter revolutions with the supply onto the tank, he will restore the relay connections to normal, read the meter and enter the reading and the date on a label which he will affix to the relay.

Should a further call be received for service on the next day, the meter readings should be checked and if there has been no additional registration, the relay shall be bridged and referred to the Meter Superintendent for checking.

- (5) Emergency Service Officers attending calls for block heater installations (also controlled by frequency injection equipment), will have to temporarily turn on relays to establish the cause of failure on these jobs. However, as block heaters are generally not thermostatically controlled they cannot be left on, except in cases of hardship or severe inconvenience, when arrangements must be made for the unit to be isolated by another officer in 7 hours and the job coded 9(b) L.

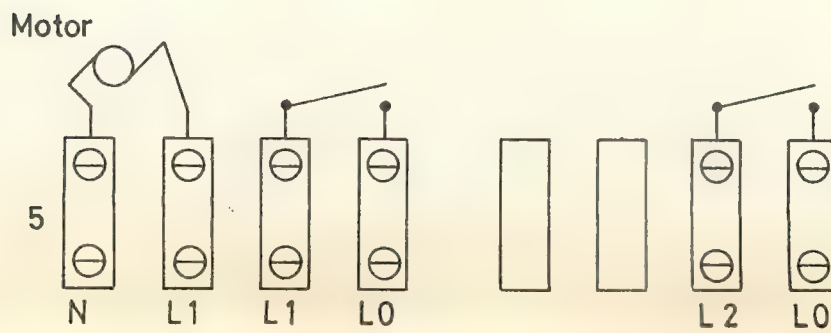
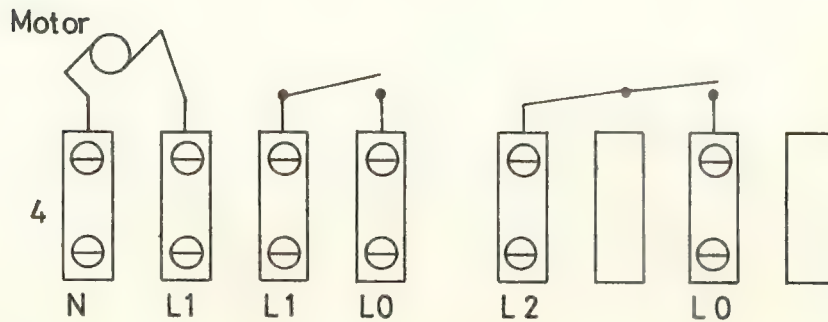
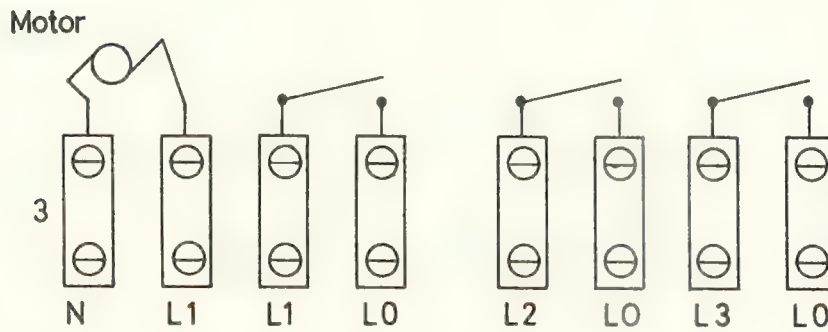
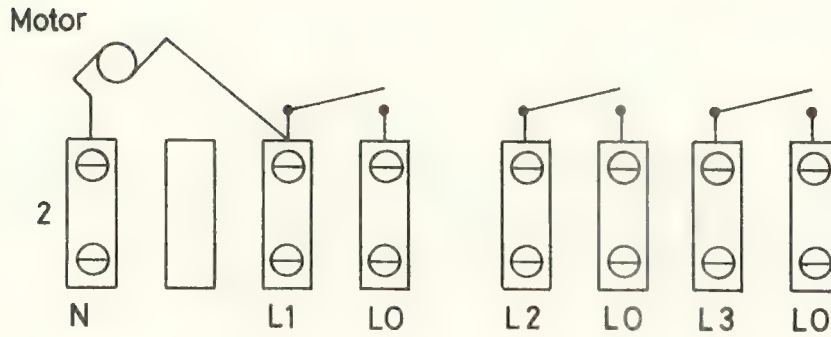
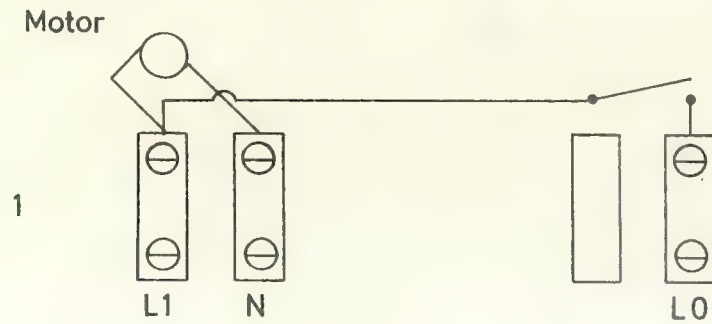
In all other cases, the heaters will be left isolated and job treated as urgent and coded 6(i) U.

Notes:

- (1) Due to a relatively short leakage path inside the top cover of the receiving relay, cases have been found where, due to an accumulation of moisture in the relay, the attaching screw has become energised. Officers will therefore treat all seals and screws as energised metal and test accordingly. It will be necessary, due to the possible high impedance of the leakage path, to test with a neon test pencil if test lamps do not light. If any evidence of energised screws is found or if moisture is evident behind the top glass, do not remove the top cover. The receiver will be bridged externally (as described above) and reported as defective.
- (2) A safety hazard exists where a receiver, particularly one of the multi-pole type, is installed in a "N.S.W. Standard" meter box. Because of the proximity of the earthed metal of the box, it is difficult to test or bridge the receiver while conductors are "live".

Whenever the field officer feels that there is some danger in operating with the receiver terminals "live", the supply to the relay shall be isolated at the meter/s, by withdrawing the load tail/s, before any work is carried out and restored to normal on completion of the work.

DIAGRAMS OF CONNECTION BLOCKS ON (1) SINGLE PHASE ZELLWEGER RELAY;
2,3,4,5 TWO & THREE PHASE ZELLWEGER RELAYS.



The water heating rates are listed below;

Current Rates

Off Peak Rate 1

Off Peak Rate II

Obsolete Stored Heat Rates

Rate A Restricted Use

Rate B Unrestricted Use

Off Peak Rate

Extended Off Peak Rate

Storage water heaters which are eligible to be supplied at the Stored Heat Rates (Obsolete) are eligible for supply at the Off-Peak Rate 2, however there is no compulsion to change rates.

Transfer between rates shall not be made at intervals of less than 12 months unless additional Stored Heat Rate load is connected at the same time.

OFF-PEAK RATE 1

To be eligible for Off-Peak Rate 1, a storage water heater must have a minimum capacity of 60 gallons or a rated hot water delivery of not less than 250 litres and meet the following requirements.

Heater Capacity in Gallons or Rated Hot Water Delivery in Litres		Number of Heating Elements	Rating of Each Heating Element
Capacity Imperial Standard	Rated Hot Water Delivery Metric Standard		
From 60 gallons up to and including 100 gallons	From 250 litres up to and including 400 litres	1	4.8 kW
Above 100 gallons but not exceed- ing 120 gallons	Above 400 litres but not exceeding 630 litres	2	4.8 kW
Above 120 gallons	Above 630 litres	As necessary to provide full amount of heat required in not more than 9 hours.	

ITEM 25

One boosting element is optional. Supply to any boosting unit shall be from the Principal Rate of the premises and shall be so arranged that both boosting and main elements cannot be energised simultaneously. It should be noted that a separate single pole isolating switch should not be included in the boosting circuit as the opening of such a switch could "lock out" the main element and hot water would not be available until after the switch is reclosed. This is due to the selective nature of the top double pole thermostat.

Thermal storage space heaters with an aggregate rating of not less than 3.0 kW can be supplied for up to 8 hours each night on Off Peak Rate 1. Such heaters may not be connected on Off-Peak Rate II.

OFF PEAK RATE II

The Off Peak Rate 2 will be available to water heaters of not less than 25 gallon capacity or a rated hot water delivery of not less than 100 litres and having two groups of heating elements as set out in the following table.

Heated Capacity in Gallons of Rated Hot Water Delivery in Litres		Number of Heating Elements		Rating of Each Heating Element
Capacity Imperial Standard	Rated Hot Water Delivery Metric Standard	Main	Boosting	
From 25 gallons up to but not including 60 gallons	From 100 litres up to but not including 250 litres.	1	1	4.8 kW
From 60 gallons up to and including 100 gallons	From 250 litres up to and including 400 litres	1	1 (Optional)	4.8 kW
Above 100 gallons but not exceed- ing 120 gallons.	Above 400 litres but not exceeding 630 litres.	2	1 (Optional)	4.8 kW
Above 120 gallons	Above 630 litres	As necessary to allow switching lower element off for a period not exceeding 7 hours.		

Booster elements shall be supplied at the Principal Rate of the premises and supply shall be continuously available. Boosting and main elements shall be arranged so that both cannot be energised simultaneously. See also booster information under Off-Peak Rate 1.

ITEM 25SUBSIDY PAYMENTS

Subsidies are no longer paid on Storage Water Heaters.

ELEMENT TYPES

Elements may be a single element of 4.8 kW or may be a double element consisting of two 2.4 kW elements in parallel. This will necessitate checking of tanks on complaint of insufficient hot water as a meter check for a 60 gallon tank could show 2.4 kW connected load, but actual load should be 4.8 kW: element would be half O/C.

METRIC CONVERSIONTHERMOSTATS

Common Settings	170 ⁰ F	-	75 ⁰ C
	160 ⁰ F	-	70 ⁰ C
	140 ⁰ F	-	60 ⁰ C

For any other setting, use formula $^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$

ENERGY

The following rates of energy consumption for water heaters may be used as a guide for field officers:

1 kWh per 3 gallons for a temperature rise of 120⁰F (50⁰F cold)
 1 kWh per 11 litres for a temperature rise of 57⁰C (10⁰C cold)

PRESSURE

For convenience 1 P.S.I. = 7 kPa (approx.)

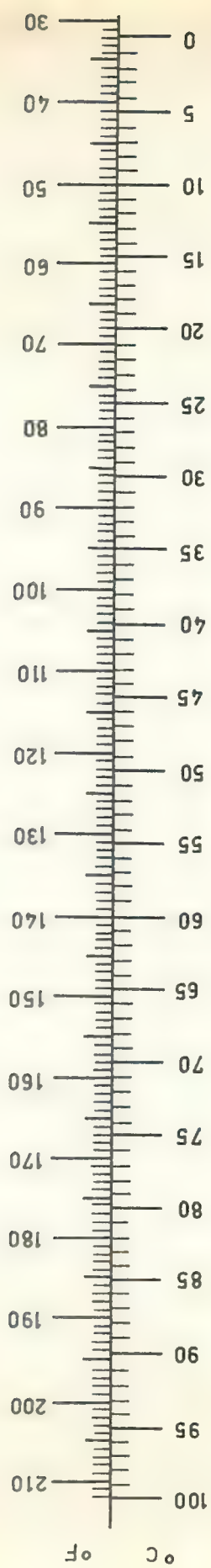
This figure will be used as a conversion factor on most pressure reduction and pressure relief valves.

STORAGE CAPACITY

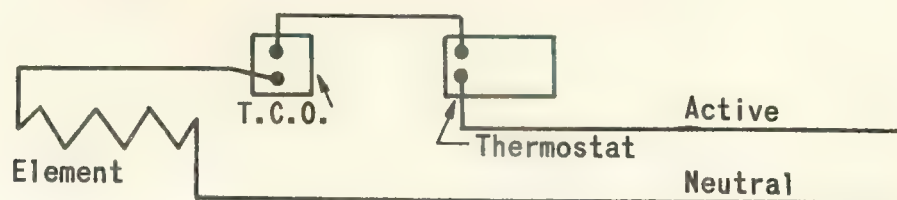
1 litre = 0.22 gallons approx. OR 1 gallon = 4.5 litres approx.

For comparative sizes, see Table "Comparison of Sizes" noting that Metric Heaters are rated in hot water delivery and not in storage capacity only.

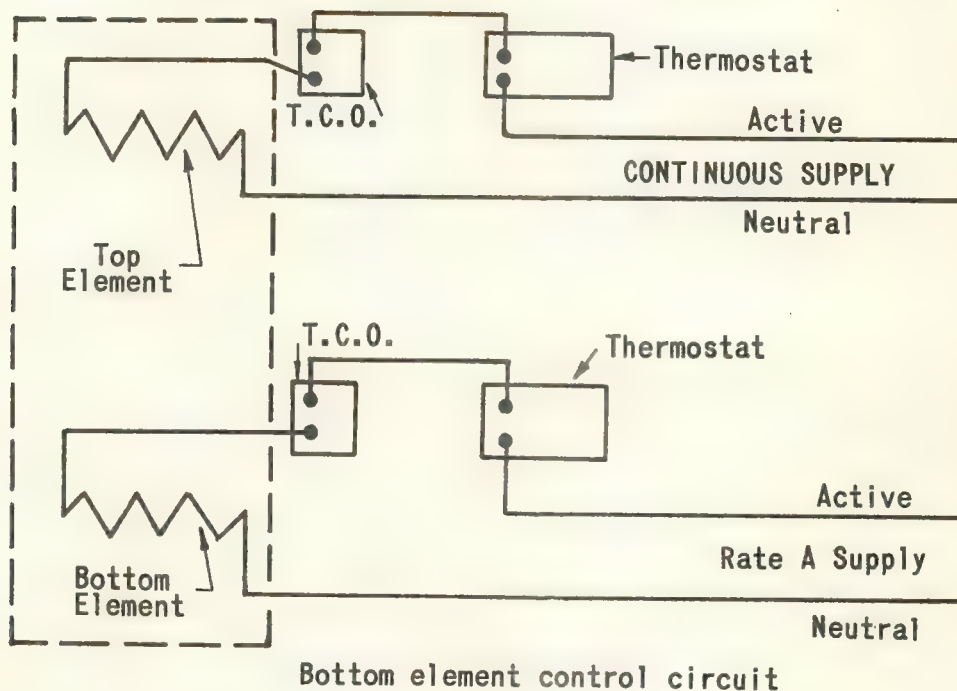
TEMPERATURE
CONVERSION
SCALE CHART



WATER HEATER CONTROL CIRCUITS WITH THERMAL CUT-OUTS

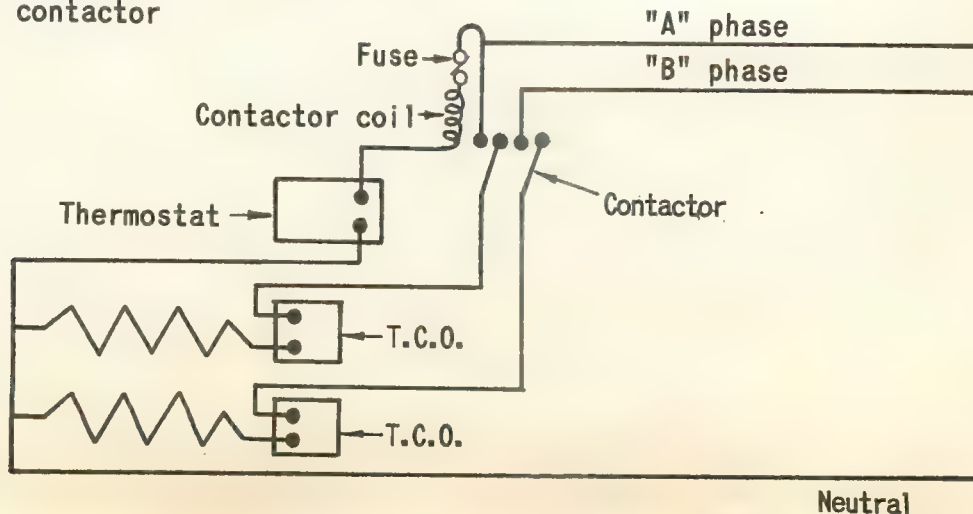


BOOSTER ELEMENT CONTROL CIRCUIT



CONTACTOR CONTROL CIRCUIT

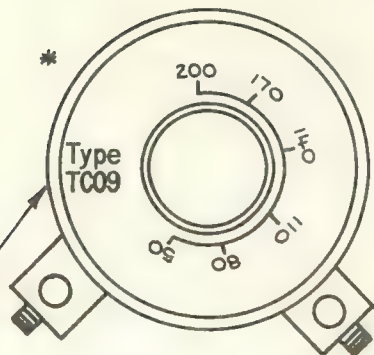
NOTE: T.C.O. must not control contactor coil.



IMMERSION TYPE THERMOSTATS WITH THERMAL CUT - OUTS

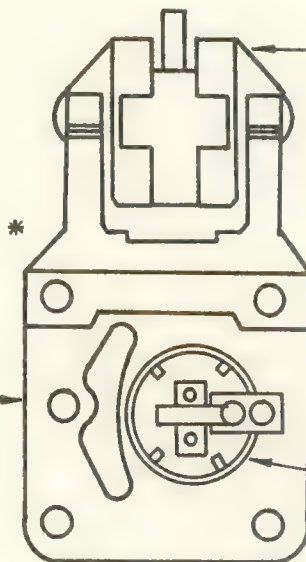
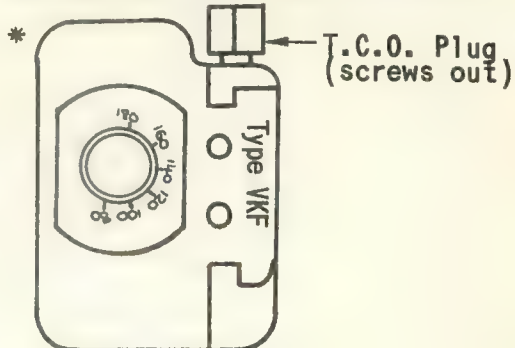
* No longer available

Satchwell thermostat Type VKF
which indicates inbuilt T.C.O.



Maclaren thermostat
with inbuilt thermal
cut-out - T.C.O.9 or
T.C.O.11 (This will
be indicated on
thermostat dial)

Plan Views
with covers
fitted.

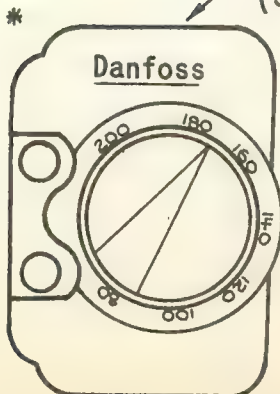


"General Controls" or
"Thermo Disc" Thermal
Cut-out clamped to element
mounting boss which
includes an "OTTER"
capsule type thermostat.

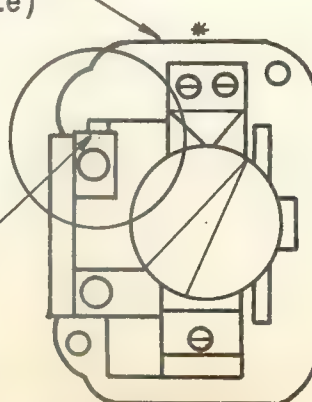
Element Boss

"OTTER" capsule
type thermostat

Danfoss thermostat
Type NR-04/B0174
(stamped on back plate)



Plan view with cover fitted

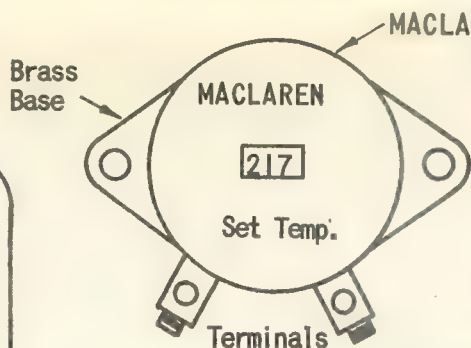
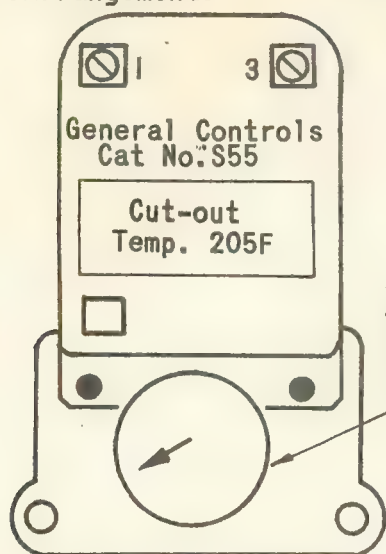


Thermal
cut-out
contacts

Cover removed - Plan view

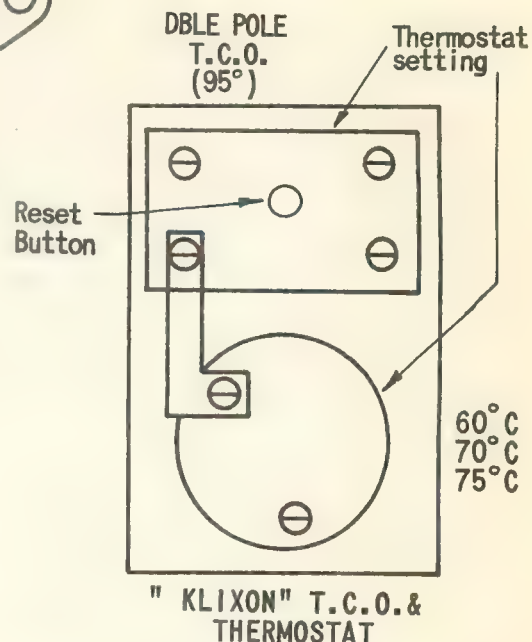
CLAMP-ON TYPE THERMOSTATS WITH BUILT-IN & EXTERNAL T.C.O.'s

NOTE: Warning notice on side.
Also Horizontal Ter. Arrangement.



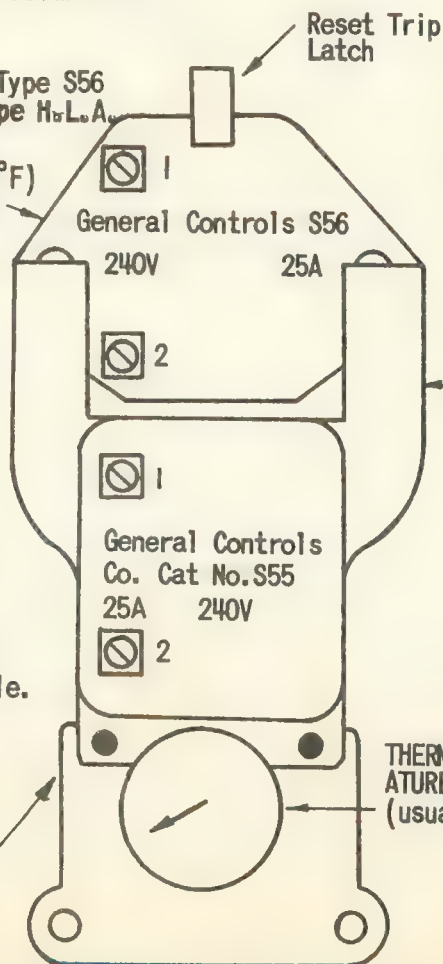
THERMOSTAT TEMPERATURE SETTING DIAL (usually set 170°F)

"GENERAL CONTROLS" Thermostat (Type S55) with in-built T.C.O. (usually preset 205°F)
Single Pole - 2 Terminals

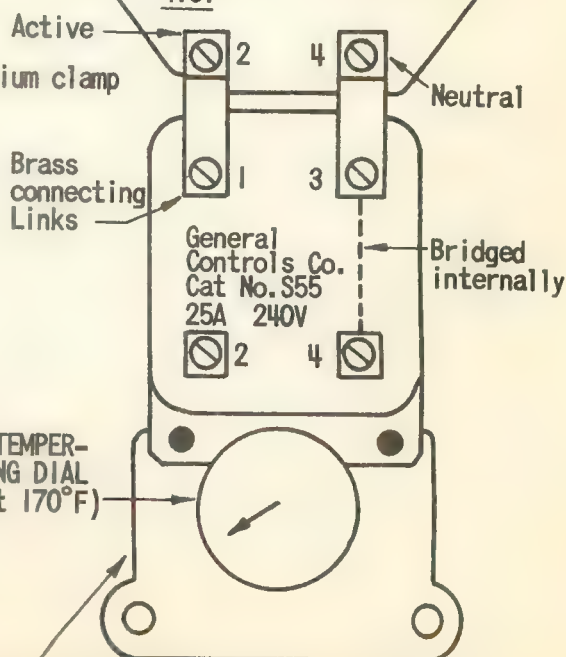


"KLIXON" T.C.O. & THERMOSTAT

General Controls - Type S56 or "Thermo-Disc" - Type H.L.A. Single Pole T.C.O. (usually preset 205°F) (stamped on bottom)



General Controls - Type S56 or "Thermo-Disc" - Type H.L. Double Pole T.C.O. (usually preset 205°F - 95°C stamped on bottom)



NOTE: Vertical Ter. Arrangement.

NOTE: All T.C.O.'s now double pole.

THERMOSTAT TEMPERATURE SETTING DIAL (usually set 170°F)

General Controls - Type S55 or "Thermo Disc" - Type A.W. Single Pole 2 Terminal Thermostat

General Controls - Type S55 - 4 Terminals Single Pole Thermostat

1000-0000-0000
1000-0000-0000

1000-0000-0000
1000-0000-0000



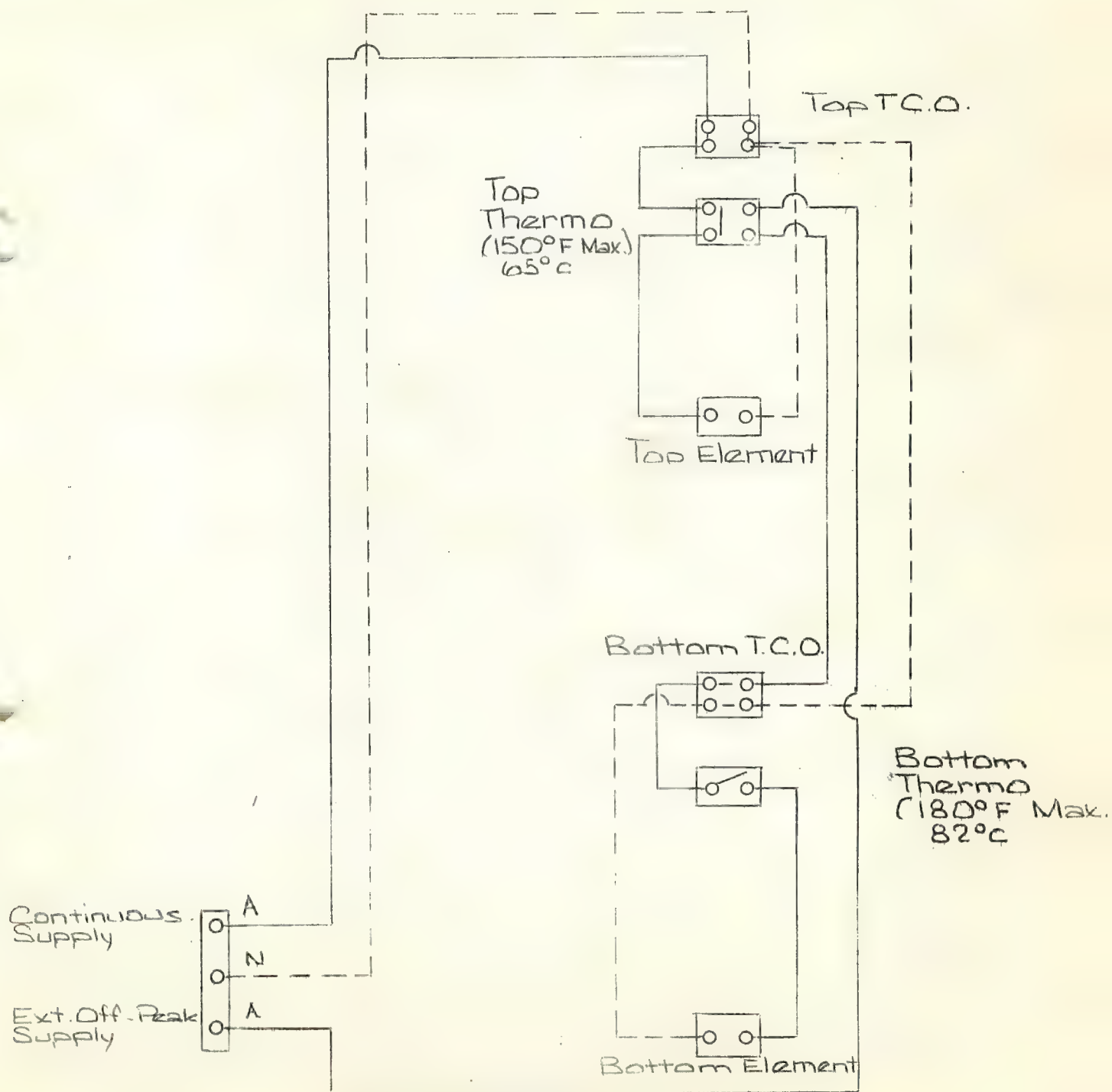
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1000-0000-0000

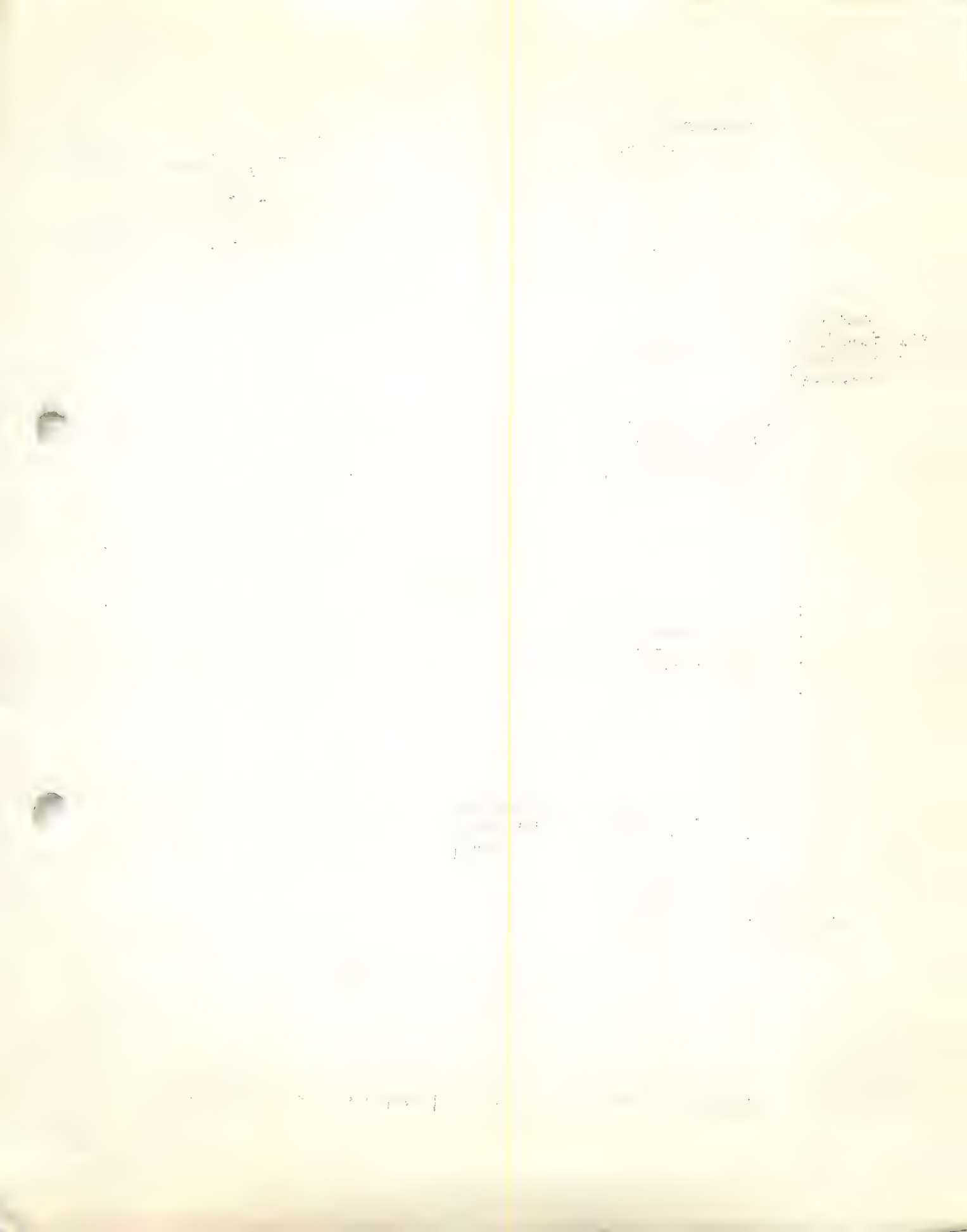
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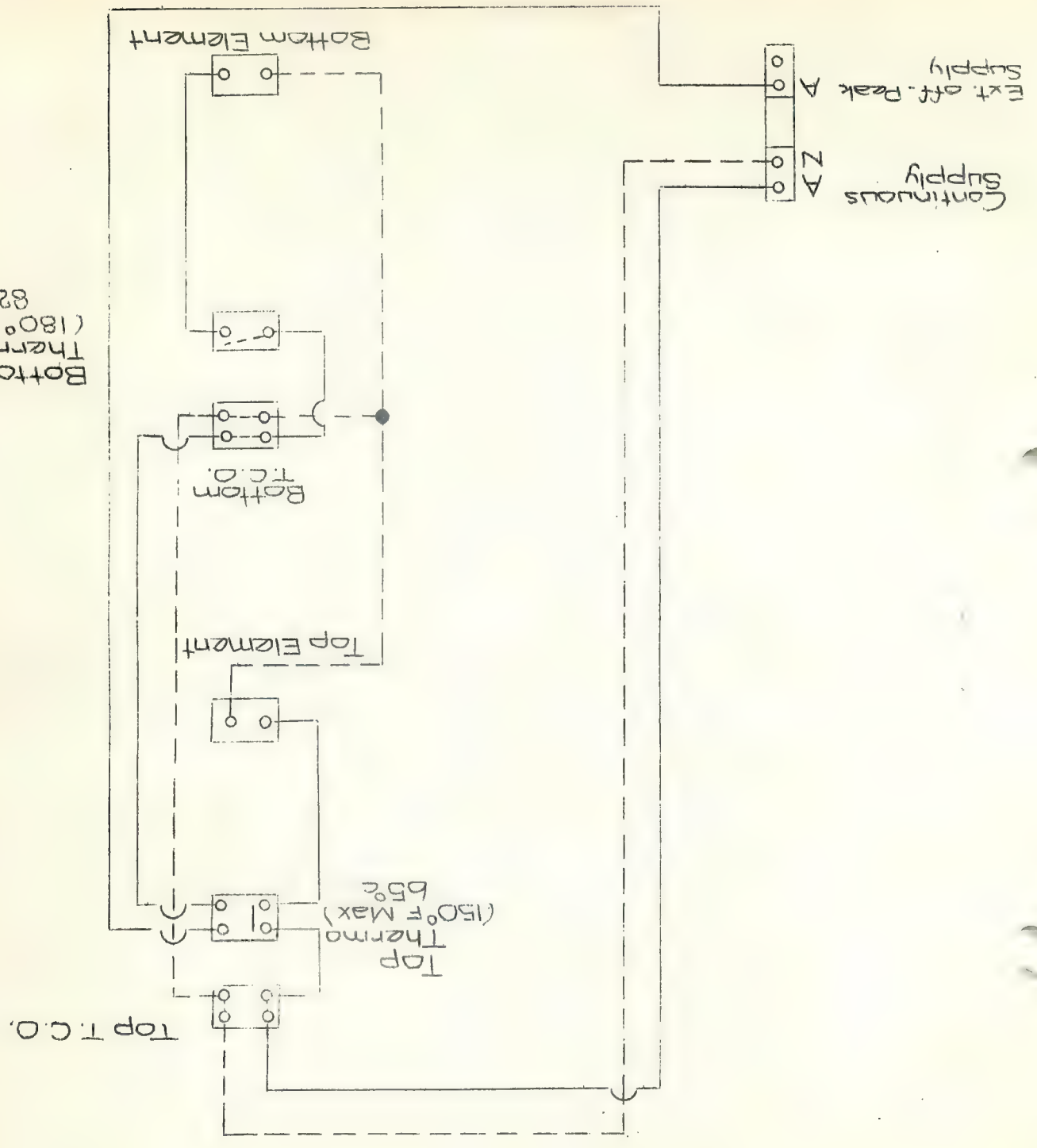
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1000-0000-0000

Dux: Extended Off-Peak Heater

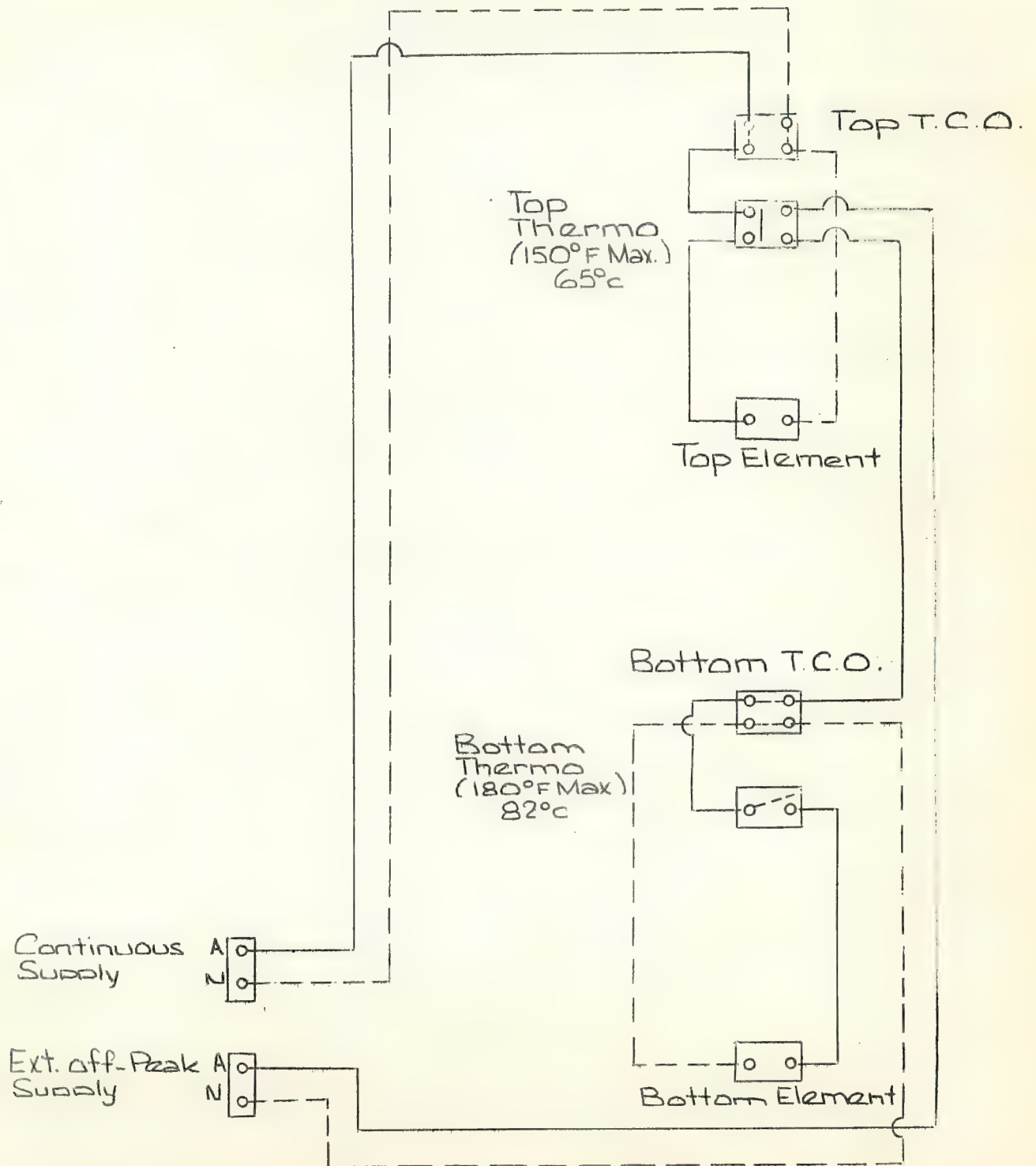




"Lanco" Extended Off-Peak Heater



"Rheem" Extended Off-Peak Heater



1. The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

2. The second part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

3. The third part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

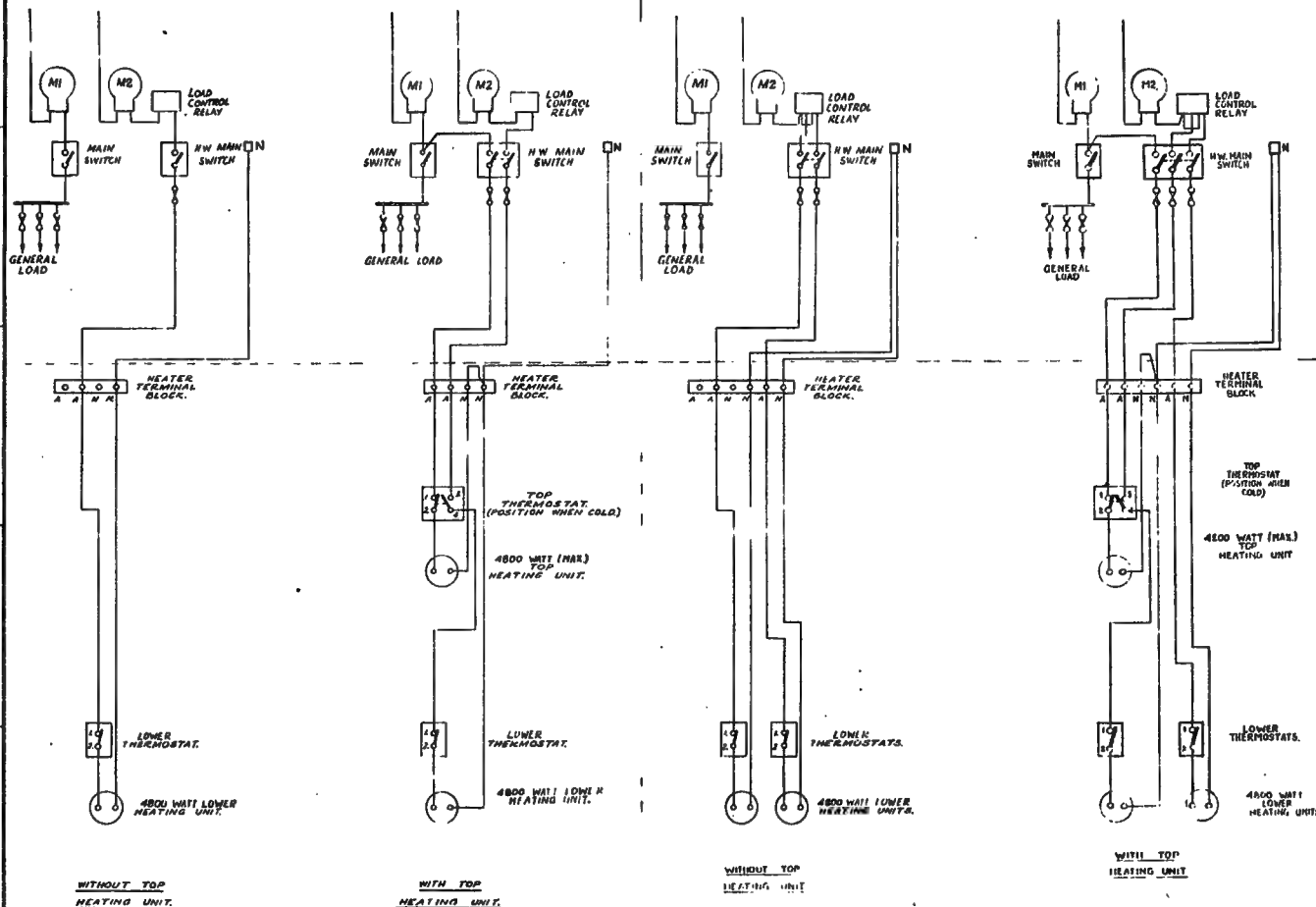
4. The fourth part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

5. The fifth part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

6. The sixth part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.

01698X

APPENDIX 2 OF SECTION 1



NOTE: DETAIL SHOWN BELOW BROKEN LINE IS HEATER WIRING INTERNAL ARRANGEMENT AND MAY VARY FOR DIFFERENT MANUFACTURERS.

HEATERS ABOVE 400 LITRES BUT NOT EXCEEDING 630 LITRES RATED HOT WATER DELIVERY.

HEATERS FROM 400 LITRES UP TO AND INCLUDING 400 LITRE RATED HOT WATER DELIVERY.

THE SYDNEY COUNTY COUNCIL

ROOF MOUNTED VENTED TYPE

WATER HEATER

WIRING DIAGRAMS.

SCALE	DATE	20-5-66
DRAWN	K.A.R.	A.E.S.S.
SUPV.	S.L.	A.D.C.
DEV.	S.L.	A.D.C.
M.S.	N.M.	
C.I.E.		

X8691C/5

AMENDMENTS
1. Ref 16.17 Wiring of Interconnection L.A.R. 12.6.65
2. Refs 16.17, 16.18 NEUTRAL WIRE 12.6.66
3. Ref 16.17 Wiring of Interconnection WITH TOP HEATING UNIT 12.6.66
4. Ref 16.17 Wiring of Interconnection WITH TOP HEATING UNIT 12.6.66

SECTION 3A
SPACE HEATERS AND AIR CONDITIONING

Joseph Thermaster Controlled-Output Off Peak
Thermal Storage Room Heaters

These heaters are supplied in six models rated from 2.25 K.W. to 6.00 K.W., the most common models in use are the 3.00 K.W., 4.5 K.W., and 6.00 K.W. heaters.

The heat bank control is situated on front top right hand corner of heater and has three switches marked OFF, NORMAL, AND HIGH, underneath there is an indicating light which when on, denotes that the heat bank isolating switch has been turned to supplementary heating at the change over switch located at the bottom of the right hand end, removable panel.

This switch can be used for supplementary heating when the stored heat has been used, and energises a 2.2 K.W. element which is supplied from the general supply rate. The fan and room thermostat are also connected to the general supply rate.

The room thermostat is usually mounted about 4'6" from the floor at a convenient point away from the heater for automatic control.

To inspect element connections and fusible link for the purpose of testing, it will be necessary to remove the right hand end panel.

To achieve this it is necessary to first remove the indicator knob of the change over switch at the lower edge of panel, put switch in the off position, unscrew the holding screw until it is flush with knob surface and then ease knob off shaft. If knob remains fast, press screw into knob to release holding splines, then ease knob off shaft.

Remove the two fixing screws located in recessed lower section of panel. Pull bottom of panel away from unit and down, the end panel will now left clear of unit. (See diagram 1)

This diagram is for a 3.00 K.W. heater and shows two elements and one fusible link, 6.00 K.W. heaters have four elements and two fusible links.

The heating elements consist of 1.5 K.W. ceramic bobbin type elements mounted above each other in an especially designed Mechanite casting which stores heat up to 1500°F (800°C). These cores are encased in sheet metal separators and surrounded by 3 inches of K-lite insulation and $1\frac{1}{2}$ " of rock wool to prevent the external skin of heater from rising above 120°F.

The thermostat located to the left of the change over switch restricts the core temperature to between 750° and 800° C and is set and sealed in the factory and must not be altered.

In the event of failure in operation of the heater thermostat, the core temperature can rise to approximately 880° C before the fusible link or links melt, isolating heater from the supply. The fusible links are designed to melt at 245° F.

The Sydney County Council does not normally service this type of space heater and customers should be referred to the manufacturer. However if the customer insists on service from S.C.C. having been dissatisfied by service from the manufacturer, jobs may then be referred to the Electricity Development Branch.

Concrete Block Heaters - Faults that may Occur

It is not anticipated that many electrical faults will occur with concrete block heaters themselves. The most probable fault would be H.R.C. terminal connections which should be readily adjustable by the emergency service officer attending.

In the event of a more serious fault occurring such as "O/C element" the block heater should be referred to the Electricity Sales Branch only in the case of Sydney County Council sale out of guarantee. Where the heater is a private sale or Sydney County Council sale and still in guarantee, the heater should be referred to the manufacturers.

When a heater, or heaters, is found not to be energised after the time switch has "cut in" it may be found that there is an external thermostat installed in the circuit controlling coil of contactor. This thermostat may be found fitted to an external wall of the building just outside a window on the same floor as the other controls.

In the event of such a thermostat being installed a check is to be made of the temperature setting. This may be found to be set at some setting less than 56° F and in such cases must be altered to 56° F as the average minimum temperatures for Sydney during the months of June, July and August are 48.3° F, 46° F and 47.6° F respectively.

Further when checking the time switch of concrete block heaters in buildings where there are multiple connections of these heaters, during peak winter load conditions, the same precautions should be taken as with Rate "A" hot water service installations (Sect. 8 Item 5).

3.

Under such circumstances, the main switch of the block heaters should be opened while the time switch is being checked.

Where the loading is such that it may interfere with the "peak demand" if the block heaters are "cut in", the emergency service officer should check with the System Operator and obtain his permission before switching this type of installation on during the peak periods.

Concrete block heaters are not thermostatically controlled for the purpose of restricting heat temperature.

Some models must not be left switched on in excess of twelve (12) hours, therefore if for reason of hardship to customer, the time switch is cut in, it must only be done before 11.00 a.m., and then only for a maximum heating period of 7 hours. Code 9 (b) L 7 hours.

When the permission of the System Operator is granted, the customer is to be advised that it would be to no advantage to have the heaters turned "on" prior to the next heating period as there would be no benefit from the heaters until late in the evening. The emergency service officer is also to advise the customer that the block heaters would be operating normally the next morning.

Replacement of Defective Time Switches

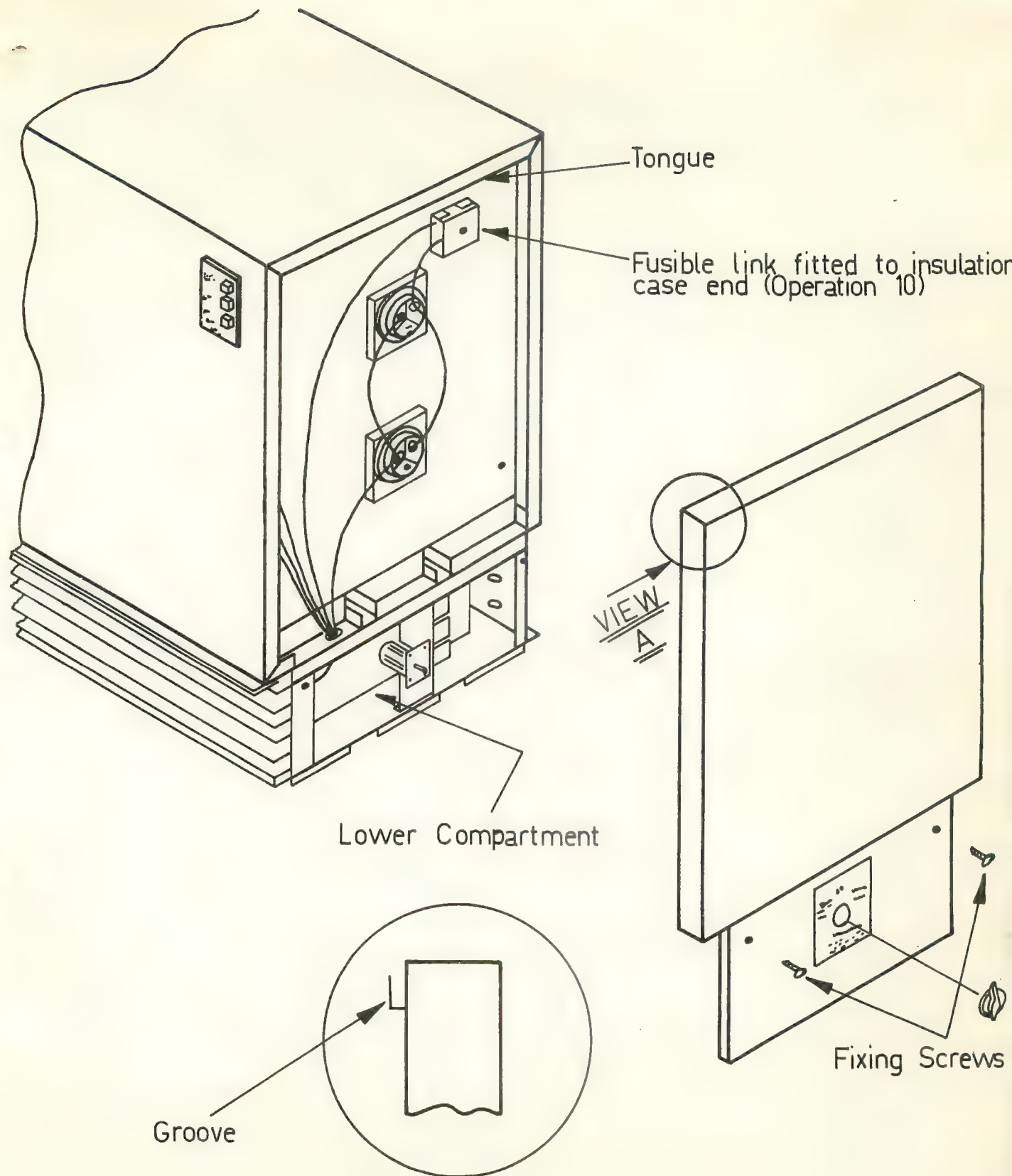
Stocks of one (1) of each type of time switch marked O/F.S., O/S and O/F are held in a special box in the Emergency Service Officers' City Depot, Crows Nest Depot.

During ordinary working hours, Emergency Service Officers shall bridge defective time switches controlling concrete Block Room Heaters and report defect to the Radio Telephonist as a U job, for urgent attention by the Meter Branch immediately on completion of the job.

Outside ordinary working hours, Emergency Service Officers shall, by arrangement with the Despatch Officer - Co-ordination, replace the defective time switch with one of the same type taken from the special box at City Depot or Crows Nest Depot.

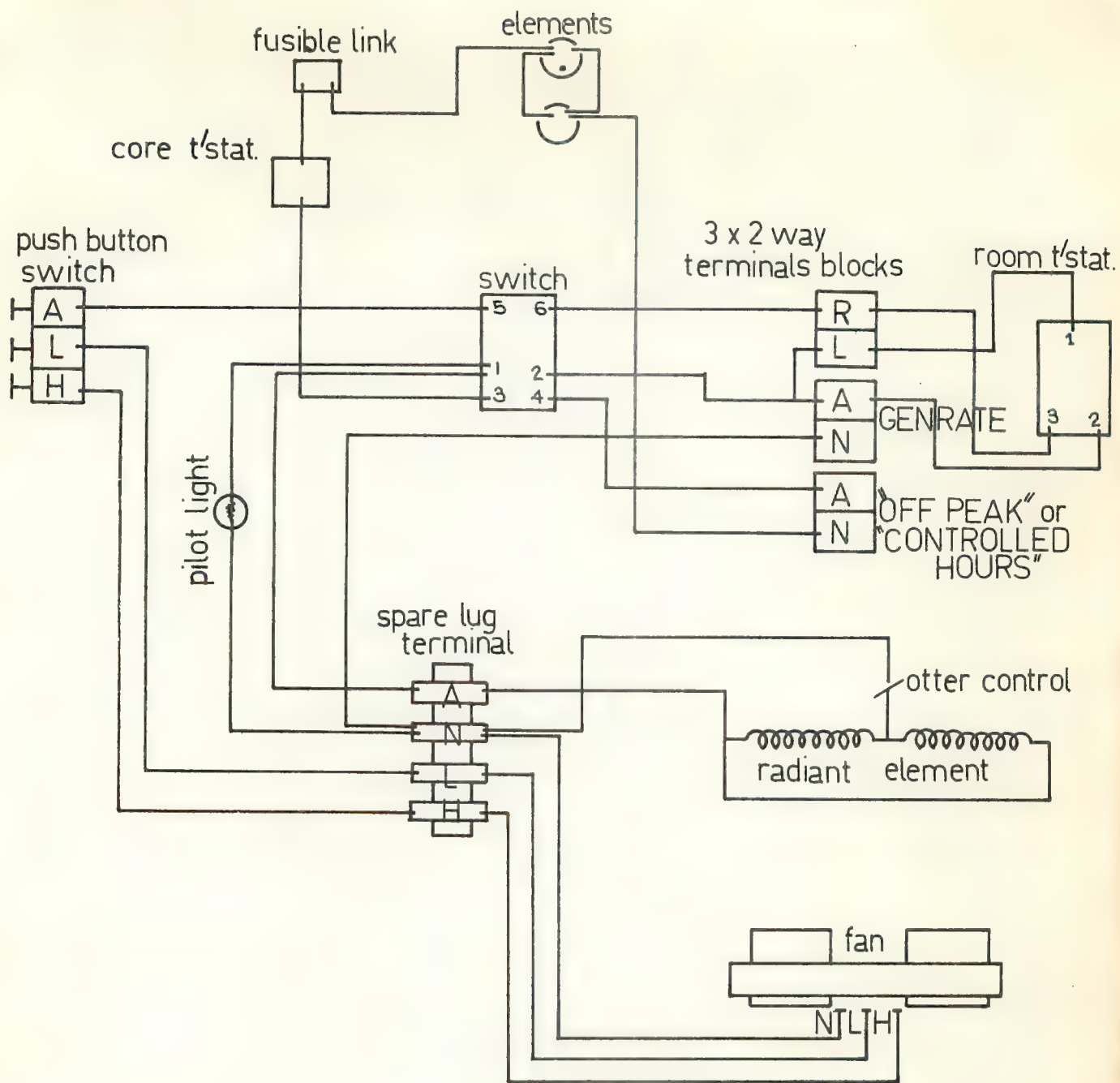
The record card and the test card attached to the time switch shall be completed and the defective time switch shall be placed in the special box.

On no account must this type of time switch be bridged without immediate arrangements being made for replacement time switch, as concrete block heaters are not thermostatically controlled and rely on time switch control to prevent overheating.



Joseph Thermaster Controlled- Output Off Peak
Thermal Storage Room Heaters

FIG 1



WIRING DIAGRAM for 3.00kW

Joseph Thermaster Controlled-Output Off Peak
Thermal Storage Room Heaters

1870

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SECTION NO. 4

FREE OUTLET (PUSH THROUGH) HEATERS

Item No. 1. General

2. Types of Defects Which May Occur in Heaters.
3. Action to be Taken by Officers Attending Heaters at Customers' Premises.
4. Requests for Disconnection of Heaters.
5. Method of Disconnecting Heaters.
6. Information required When Reporting Defects.

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SECTION NO. 4FREE OUTLET (PUSH THROUGH) HEATERSITEM NO. 1 - GENERAL

Free Outlet (Push Through) Heaters at customers' premises may be classified as:

- (a) On hire-purchase from The Sydney County Council.
- (b) Privately owned.

They will be serviced by the Appliance Repair Section of the Electricity Development Branch subject to the conditions as set down in Section No. 1 of this handbook headed "Servicing of Electrical Apparatus by The Sydney County Council".

ITEM NO. 2 - TYPES OF DEFECTS WHICH MAY OCCUR IN FREE OUTLET
(PUSH THROUGH) HEATERS

The following are some of the defects which may occur in Free Outlet Push Through Heaters:

- Defective heating element
- Defective thermostat
- Defective switch
- Stoppage in flow
- Water leaking from restrictor valve
- Overflow from overflow pipe.

ITEM NO. 3 - ACTION TO BE TAKEN BY OFFICERS ATTENDING FREE
OUTLET (PUSH THROUGH) HEATERS AT CUSTOMERS' PREMISES

Emergency Service Officers shall repair broken wiring connections or defective switches in a permanent manner if possible; if not possible; then temporary repairs should be made.

When Emergency Service Officers are unable to effect repairs the heater must be isolated from the rest of the installation and the water control turned off, if necessary.

In no circumstances, will officers interfere with plumbing work - such work must be done by a certified plumber.

The following action shall be taken when Emergency Service Officers are unable to make permanent repairs to heaters -

- (a) During Hours in Which the Appliance Repair Section is Attended:

Report through the Despatch Officer Co-ordination to the Appliance Repair Section unless, in the case of a privately owned heater, the customer wishes to make other arrangements.

(b) After Hours:

Inform the customer that the matter will be reported for attention and show particulars on the Service Report so that the matter can be referred to the Appliance Repair Section next working day unless the customer wishes to make other arrangements in the case of a privately owned heater.

ITEM NO. 4 - REQUESTS FOR DISCONNECTION OF FREE OUTLET (PUSH THROUGH)
HEATERS4. (1) Requests Received During General Office Hours:

During general office hours all requests for disconnection of heaters will, in the first place, be referred to officers of the Customers' Accounts Section, who will, after obtaining the necessary particulars from the customer, refer the work to the Appliance Repair Section.

4. (2) Requests Received Outside General Office Hours:

Outside general office hours, requests for the disconnection of heaters will be dealt with directly by the Emergency Service Section and the following procedure will be adhered to:

(a) General

- (i) Obtain full name and address of customer.
- (ii) Ascertain whether the heater is on hire purchase from The Sydney County Council or is privately owned.
- (iii) If the Heater is to be disconnected by an Emergency Service Officer, inform the customer that:

The electrical circuit will be disconnected only if the heater is connected in such a manner as to permit the disconnection being made readily. In no circumstances will the Emergency Service Officer interfere with plumbing work - such work must be done by a certified plumber.

(b) Heater on Hire Purchase from Council

- (i) If the heater is on Hire Purchase from The Sydney County Council and the new address is within The Sydney County Council's reticulated area the electrical circuit of the heater will be disconnected upon request. The address to which the heater is being removed must be shown on the Record Card.

- (ii) If the heater is on Hire Purchase from The Sydney County Council and the new address is outside The Sydney County Council's reticulated area, the customer must be informed that arrangements for the disconnection of the heater can be made only by reference to the Hire Purchase Clerk during general office hours.

(c) Heater Privately Owned:

If the heater is privately owned, arrange for an Emergency Service Officer to disconnect the Electrical circuit of the heater.

ITEM NO. 5 - METHOD OF DISCONNECTING FREE OUTLET (PUSH THROUGH)
HEATERS

Officers disconnecting a heater will act as follows:-

- (a) Ascertain if the heater is connected from a junction box or terminal box readily accessible. If the heater is not connected from a junction box or terminal box, or the junction box or terminal box is not in a readily accessible position, the officer will not disconnect the heater, but he will inform the customer that the services of an electrical contractor are required for the disconnection. A junction box or terminal box located above the ceiling is not readily accessible.
- (b) If the heater is connected from a junction box or terminal box readily accessible, the officer shall then ascertain whether the heater is controlled from a separate circuit or if it is connected to a common circuit. If the heater is controlled from a separate circuit, the officer will remove the circuit wiring from the load side of the fuse and from the neutral link, coil up the cable ends, attach a "Disconnected" label, and tuck the cable ends behind the switchboard, remove the fuse link and replace the carrier.
- (c) After disconnecting at the fuses, disconnection will be made at the junction or terminal box as follows:-
 - (i) If joints are made in the box by means of connectors or terminals, disconnect the box, leaving connectors on the ends of the cables in the box.
 - (ii) If the cables are not joined in the box, cut the cables, bare the ends of the cables and place connectors on the ends of the cables in the box.

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ITEM NO. 6 - INFORMATION REQUIRED WHEN REPORTING DEFECTS

Officers reporting defective heaters will supply the following details:-

- (a) Make of heater.
- (b) Whether purchased from The Sydney County Council
or purchased privately.
- (c) Nature of defects.
- (d) Action taken concerning defect.

ATTACHMENTS

- (1) Free Outlet (Push Through) Sink Heater over sink type
- (2) Free Outlet (Push Through) Sink Heater under sink type
- (3) Free Outlet (Push Through) Shower Heater
- (4) Free Outlet (Push Through) Bath Heater

ITEM NO. 7 - THERMAL CUTOUTS FITTED TO 3 PHASE HEATERS

Langco three phase heaters, type I.W.S. 3, have two protective devices incorporated in this heater, namely an Eutectic metal slug which melts at approximately 217°F, and a double pole thermal cutout which operates and opens at approximately 220°F.

If the thermal cutout opens this would be due to poor water pressure, and failure of the water pressure switch to open when flow of water falls below .6 of a gallon per minute.

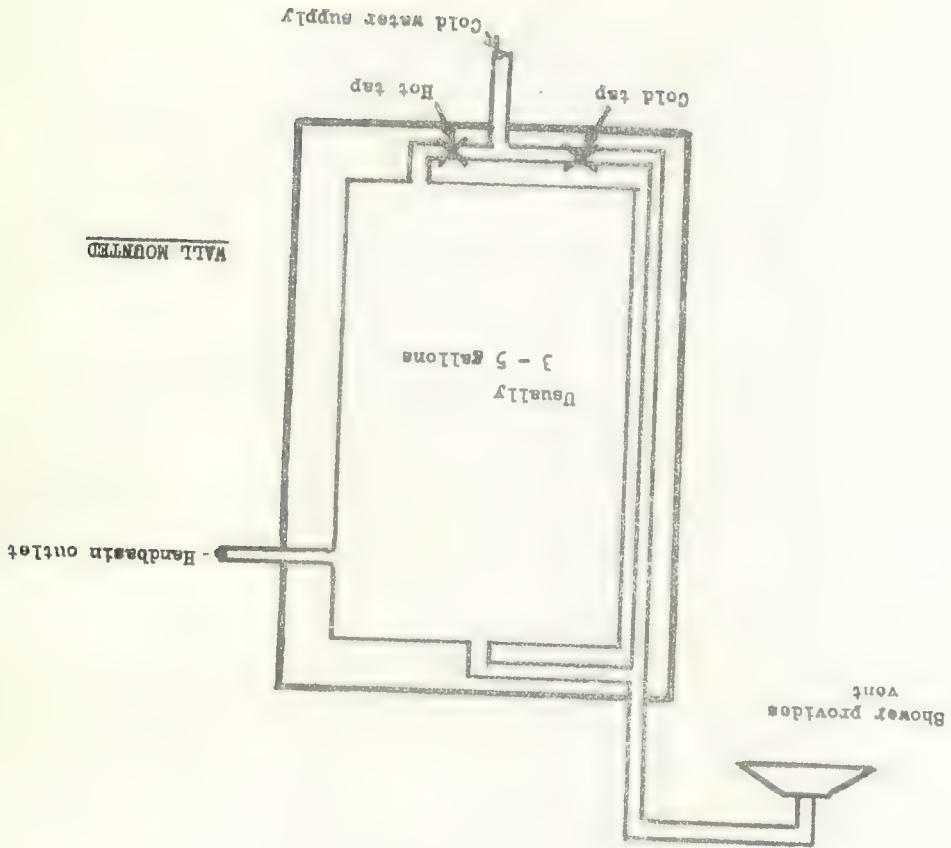
Other manufacturers may also use similar protective devices on their three phase heaters.

PROCEDURE

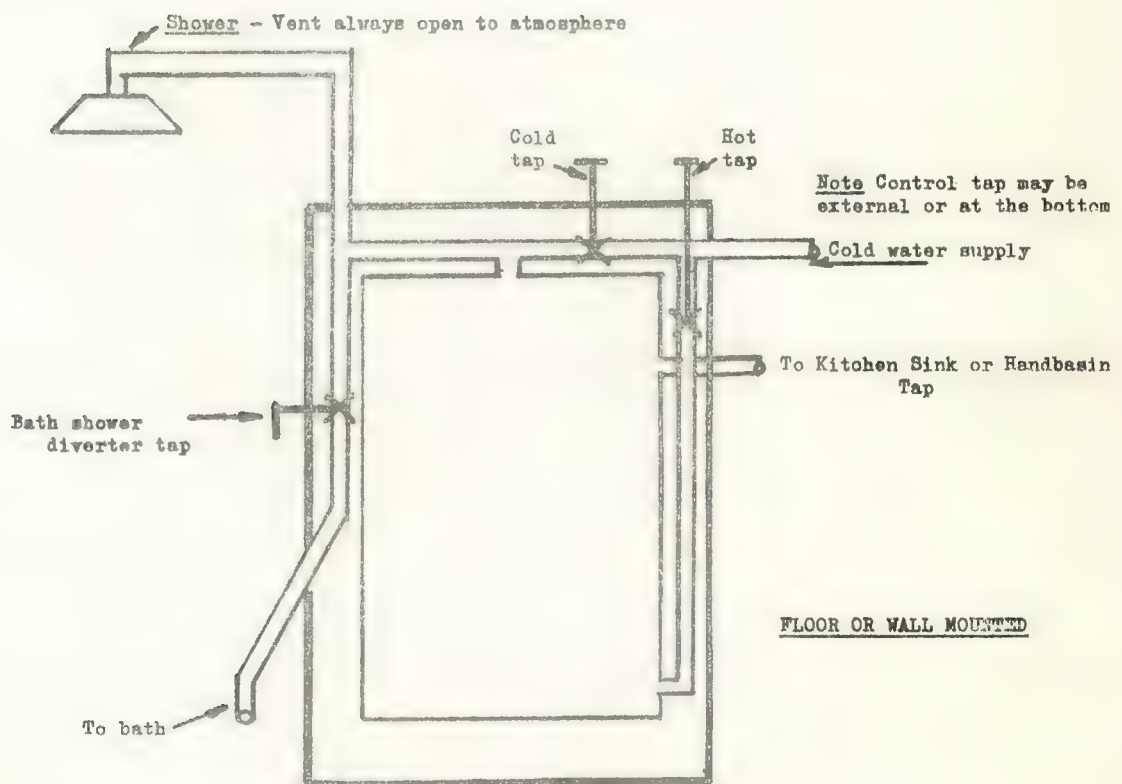
Do not reset thermal cutout. Refer to manufacturer for adjustment to pressure switch.

FREE OUTLET (PUSH THROUGH) SHOWER HEATER

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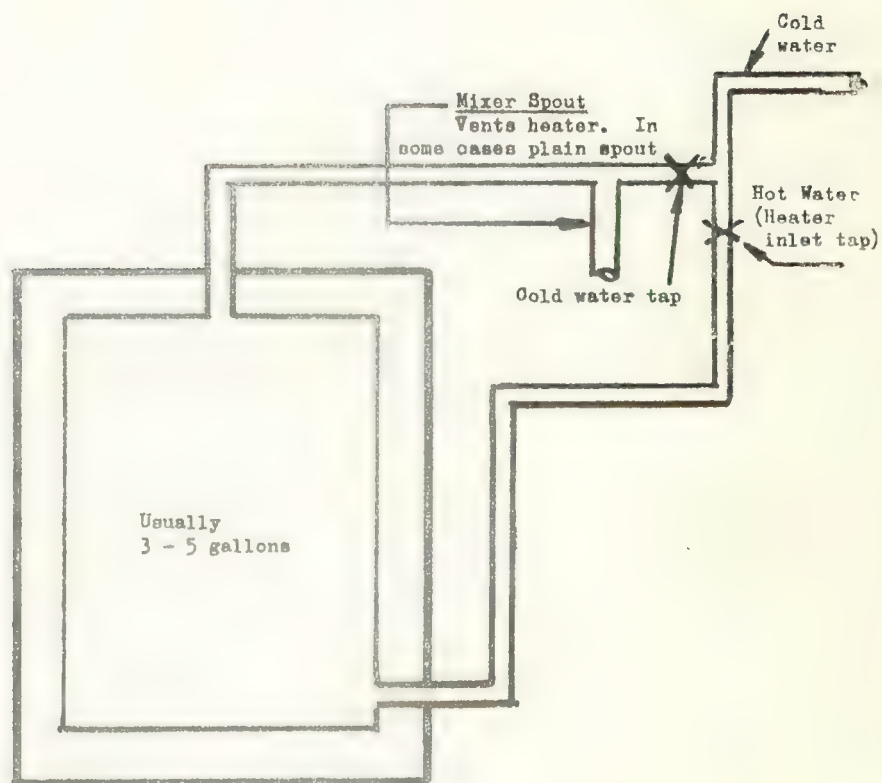
FREE OUTLET (PUSH THROUGH) BATH HEATER



To check that shower provides vent

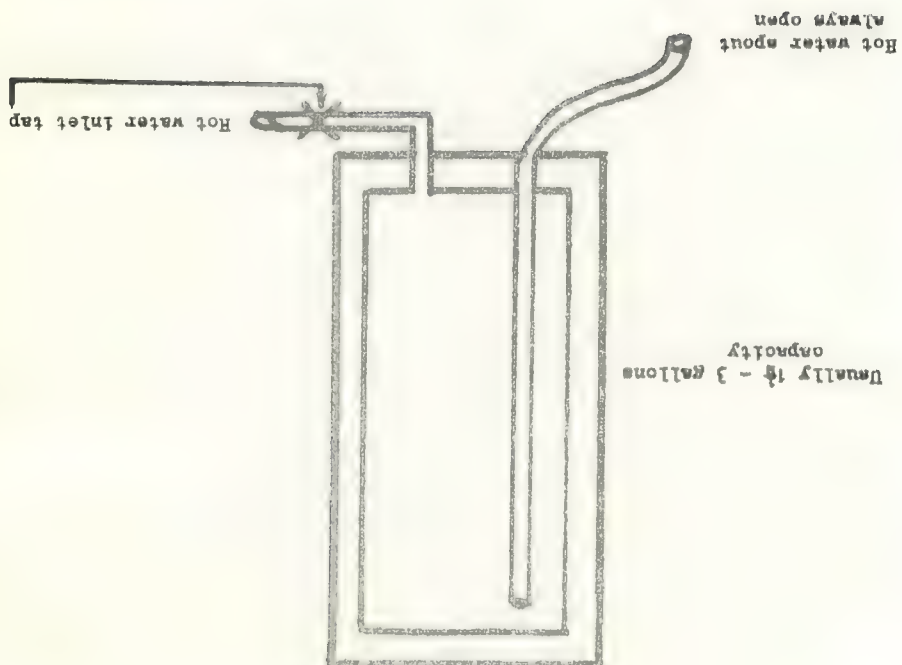
- Turn diverter to bath
- Lightly insert cork in bath spout (don't hold firmly)
- Turn hot tap on, water should flow from shower

FREE OUTLET (PUSH THROUGH) SINK HEATER UNDER SINK TYPE



NOTE: To check Hot water outlet open
- disconnect at heater and blow through

FREE OUTLET (PUSH THROUGH) SINK HEATER
OVER SINK TYPE





SECTION NO. 5.

REFRIGERATORS.

ITEM NO. 1. - REFRIGERATOR SERVICE

1. Extent of Service by the Sydney County Council.
 - (a) All refrigerators.
 - (b) Council Sales.
 - (c) Non-Council Sales.
2. Refrigerant Gas Escaping from Refrigerators.
3. Refrigerators to be Placed out of Commission.
 - (a) Open Compressor Types.
 - (b) Sealed Unit Types.
4. Restoration of Supply to Refrigerators after Periods of Disuse.
 - (a) Open Compressor Types.
 - (b) Sealed Unit Types.
5. Removal and Transportation of Refrigerators.

ITEM NO. 3. - THE ELECTRIC REFRIGERATOR - SIMPLE EXPLANATION OF OPERATION.

ITEM NO. 4. - AMMONIA CONDENSING UNITS.

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THE UNIVERSITY OF CHICAGO

DEPARTMENT OF CHEMISTRY

PHYSICAL CHEMISTRY

LECTURE NOTES

BY

PROFESSOR

SECTION NO. 5.REFRIGERATORS.ITEM NO. 1 - REFRIGERATOR SERVICE.1. EXTENT OF SERVICE BY THE SYDNEY COUNTY COUNCIL.(a) All Refrigerators.

Electric refrigerators, domestic or commercial will not be repaired by the Sydney County Council. Provided it is known that the electric supply to the refrigerator is in order, a customer requesting service for defects shall be referred to the pink pages of the Postmaster General's Telephone directory where Manufacturers and service mechanic's are listed.

Usually, no good purpose would be served by a visit by an Emergency Service Officer where a customer is experiencing trouble with a refrigerator but in the case of an elderly or confused customer, an Emergency Service Officer may be sent to isolate the faulty equipment pending a visit by a refrigerator service man.

(b) Council Sales.

Customers telephoning to complain of unsatisfactory service by manufacturers or suppliers to defects in refrigerators which have been sold by the Council, shall be transferred to the Appliance Repair Section.

Outside of normal working hours, details of the complaint shall be entered on a Service Request Card and forwarded to the Appliance Repair Section on the next working day.

(c) Non-Council Sales.

Complaints of unsatisfactory service by manufacturers or suppliers to defects in refrigerators not sold by the Sydney County Council shall be referred to the Customers' Service Section.

2. REFRIGERANT GAS ESCAPING FROM REFRIGERATORS.

Customers requesting service to electric refrigerators from which refrigerant gas is escaping, shall be advised as follows:-

- (a) Contact the manufacturer or supplier of the unit if the maintenance period has not elapsed, or alternatively, a refrigerator service man.
- (b) The refrigerator should be switched off at the power points.
- (c) The section of the premises wherein the refrigerator stands, should be shut off from the remainder of the premises.

(Over)

- (d) With due regard to (c), windows and doors should be opened where possible to permit of the free escape of gas from the room.
- (e) Be cautious of eating any food which may have been contaminated by the gas from the refrigerator.

3. REFRIGERATORS TO BE PLACED OUT OF COMMISSION.

(a) Open Compressor Types.

Customers enquiring after hours as to the precautions to be taken when about to leave a refrigerator out of commission for a period shall be advised that in the case of open compressor type refrigerator, if the refrigerator is to remain out of commission for more than a week or is to be placed into store or is to be removed to another address, it should be "shut down".

At all times, customers requiring an open compressor type, domestic or commercial, refrigerator to be "shut down" shall be advised to contact the manufacturer, supplier or a refrigerator service man.

(b) Sealed Unit Types.

Sealed unit types need only be disconnected from the supply.

4. RESTORATION OF SUPPLY TO REFRIGERATORS AFTER PERIODS OF DISUSE.

(a) Open Compressor Types.

Certain precautionary measures may be necessary before replacing open compressor type refrigerators into service after periods of disuse. The customer shall be referred to the manufacturer or supplier or a refrigerator service man.

(b) Sealed Unit Types.

Sealed unit types need only to be connected to the electric supply.

5. REMOVAL AND TRANSPORTATION OF REFRIGERATORS.

When it is necessary to remove a refrigerator to another address the unit should be bolted down to remove its weight from the suspension springs or rubber buffers during transit. This precaution is also necessary to remove any undue strain on the

copper tubing connected to the evaporator. Refrigerators should be transported in an upright position and protected with a padded delivery cover. The customer shall be advised to contact the manufacturer or supplier or a refrigerator service man.

ITEM NO. 3. THE ELECTRIC REFRIGERATOR.

SIMPLE EXPLANATION OF OPERATION by J.S. Johnson A.S.T.C.
Planning Engineer - Illumination & Domestic, Sydney County Council.

Refrigeration is basically a process by means of which heat is removed from inside a cabinet and transferred to the outside air. The difference between the various types of refrigerators lies in the methods used to effect this heat transfer.

The two systems of refrigeration which have been developed for practical application are:

- (a) The compression system, and
- (b) The absorption system.

Both systems work on a principle involving the extraction of heat from the cabinet when a liquid vaporises or boils.

To change a liquid into a vapour at the same temperature requires the application of a certain amount of heat. For example, over five times the amount of heat is absorbed in changing water at 212°F to steam at 212°F , as would be used in raising the temperature of water from freezing to boiling points. The heat so used is known as the latent heat of vaporisation.

Also it is a well-known fact that the boiling or vaporising point of a liquid is raised as the pressure of the liquid is raised. For example, water boils at a higher temperature at the higher pressure at sea level than it does on top of a mountain where the pressure is low.

In a refrigeration system the pressure of a specially selected gas or vapour, which boils at a freezing temperature at normal pressures, is increased considerably. The increase in pressure raises the temperature of the gas or vapour above the normal air temperature. Also, at the increased pressure, the boiling or vapourising point of the liquid is raised above normal air temperature.

The warm high pressure gas passes through a series of air-cooled coils known as a condenser, and the temperature is lowered to a point where the gas changes to a high pressure liquid.

The high pressure liquid is then expanded through a special valve or other device into the freezing coils or evaporator inside the cabinet. As the pressure inside the evaporator is well below the pressure at which the warm liquid will vaporise, it boils at the freezing cabinet temperature, taking up latent heat from the cabinet air and thus reducing its temperature.

The low pressure vapour is removed from the evaporator by a special pump action to be again compressed, and to repeat the heat extraction or refrigeration cycle already described.

The main differences between the compression and the absorption systems are the manner in which the vaporised refrigerant gas is removed from the evaporator and the method used for compressing it.

COMPRESSION SYSTEM.

A simple compression system is shown in Fig. 1. The low pressure refrigerant vapour is removed from the evaporator or cooling unit by the suction of a compressor or pump driven by an electric motor.

The refrigerant vapour is compressed by the pump. It then passes through the condenser where it is cooled and liquefied into a liquid receiver in which the liquid level is maintained by a float valve. When the liquid level rises above a certain point the float valve operates and allows the liquid to pass to the cooling unit or evaporator, where it is expanded through a valve or similar device.

Essentially, the compressor type of refrigerator is a motor-driven heat pump, pumping heat from the refrigerator cabinet into the air. The only energy required is that necessary to perform this pumping action, and since the electrically driven pump is highly efficient, the efficiency of the compression type refrigerator is high and its electricity costs are low compared with other types.

The compressor is thermostatically controlled, and is usually designed to operate for approximately one-third of the day during hot weather. This means that the compression or motor-driven type of refrigerator has a considerable reserve of performance, and it can therefore, respond more quickly to changes in cabinet temperature and freezes more rapidly.

Compression type of refrigerators can be divided into two main types, open compressor type and sealed unit type.

In the open compressor type of refrigerator the compressor is driven by a separate motor, usually through some form of belt drive. Care has to be exercised in manufacture to ensure that a permanent gas-tight seal is provided where the crank-shaft leaves the compressor case. It is usual to provide a cooling fan with the open compressor type of refrigerator.

The sealed unit refrigerator is a more recent development. The compressor and motor, which are of special design, are sealed in a gas-tight casing, and a special shaft seal is therefore not required. Cooling of the condenser is by natural air convection currents.

A wide variety of refrigerant gases is used in compression type refrigerators, the most common being sulphur dioxide (SO₂) and freon (a special combination of gases).

ABSORPTION SYSTEM.

A simple absorption system is shown in Fig. 2.

The refrigerant used in the absorption system is usually ammonia vapour, and the functioning of the system depends largely on the fact that ammonia vapour is readily absorbed by water.

REFRIGERATORS

Constitutionally, the cold producing unit consists of a number of steel cylinders connected by steel tubes welded in position, and it therefore, constitutes a completely sealed system.

The refrigerant charge usually consists of hydrogen gas, liquid ammonia and distilled water. The hydrogen being lighter, occupies the upper spaces (evaporator), while the heavier ammonia and water seek the lowest levels (generator and boiler).

The operation is as follows:

- (a) The electric heating element boils the ammonia water solution and drives off ammonia vapour under pressure.
- (b) The ammonia vapour passes through the condenser, where it is liquefied by air cooling.
- (c) The high pressure liquid ammonia passes through an expansion device or trap into the low pressure evaporator, where it boils and absorbs heat from the cabin.

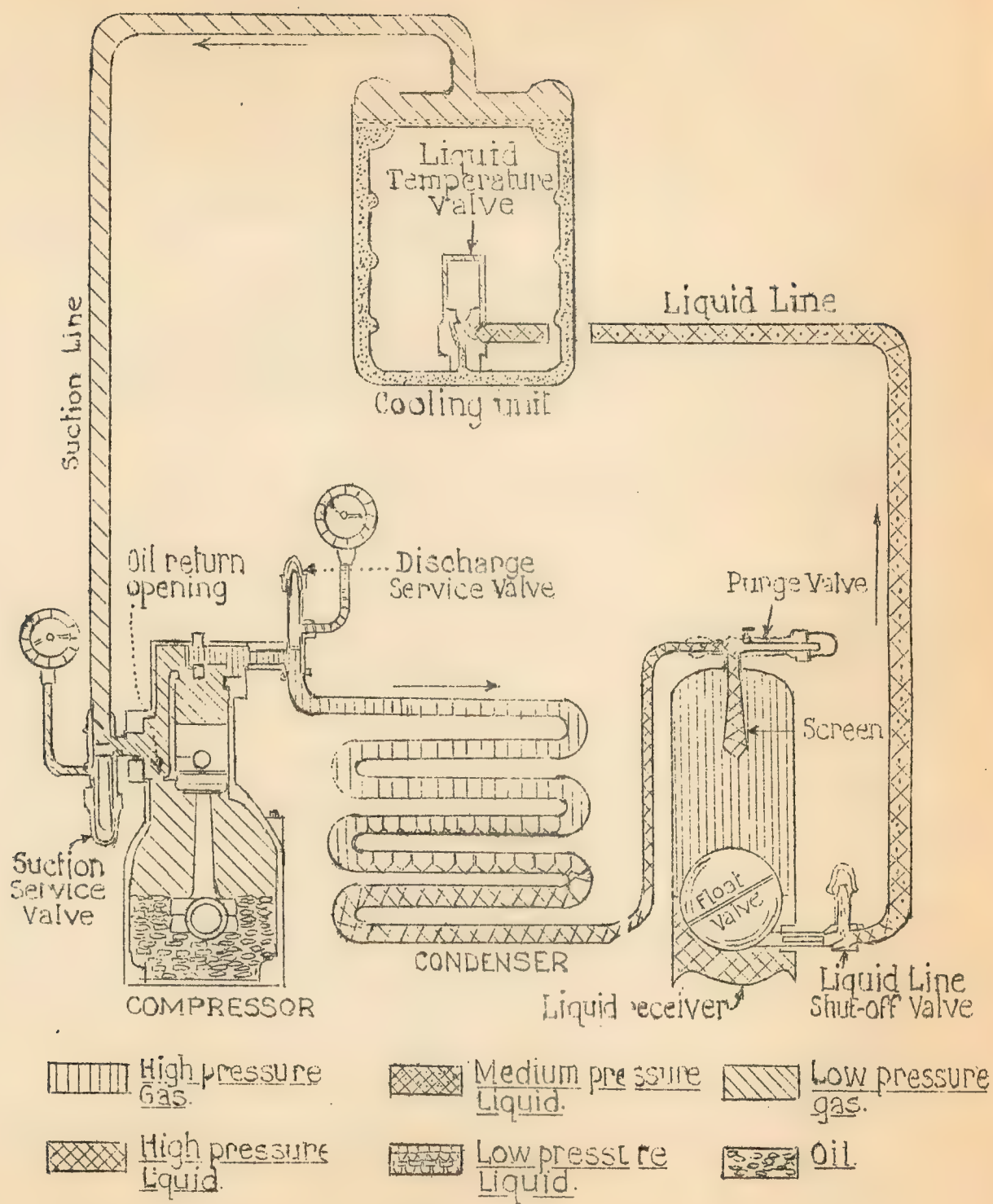
- (d) The hydrogen gas, being light, rises in the evaporator and in so doing sweeps away the vaporised ammonia, thus providing a pump action which allows the refrigeration cycle to continue so long as heat is applied to the boiler.

- (e) The cool, heavy mixture of hydrogen and ammonia vapour by gravity passes down to the absorber where it is cooled, and the ammonia vapour is absorbed into the weak solution which has been drained from the top of the boiler. The hydrogen, freed of the ammonia vapour, rises into the evaporator to continue its pumping action. The strong ammonia solution falls to the bottom of the absorber and drains back into the boiler to allow the refrigeration cycle to continue so long as heat is applied to the boiler.

Absorption or heated type refrigerators are generally designed so that the heating element operates either continuously or for a considerable part of the day under thermostatic control; consequently, they have a comparatively small reserve capacity and do not respond so readily to temperature changes, nor do they give such a fast freezing performance as the compression type refrigerator. Nevertheless, their performance has been found satisfactory for domestic purposes.

Its higher energy consumption and slower response to temperature changes make the absorption refrigerator generally unsuitable for industrial and commercial use.

Generally, it can be said that the manufacture of the absorption type of refrigerator does not involve such heavy tooling costs, and consequently, it tends to be produced in relatively small to medium quantities. It can, therefore, usually be marketed at lower retail prices.

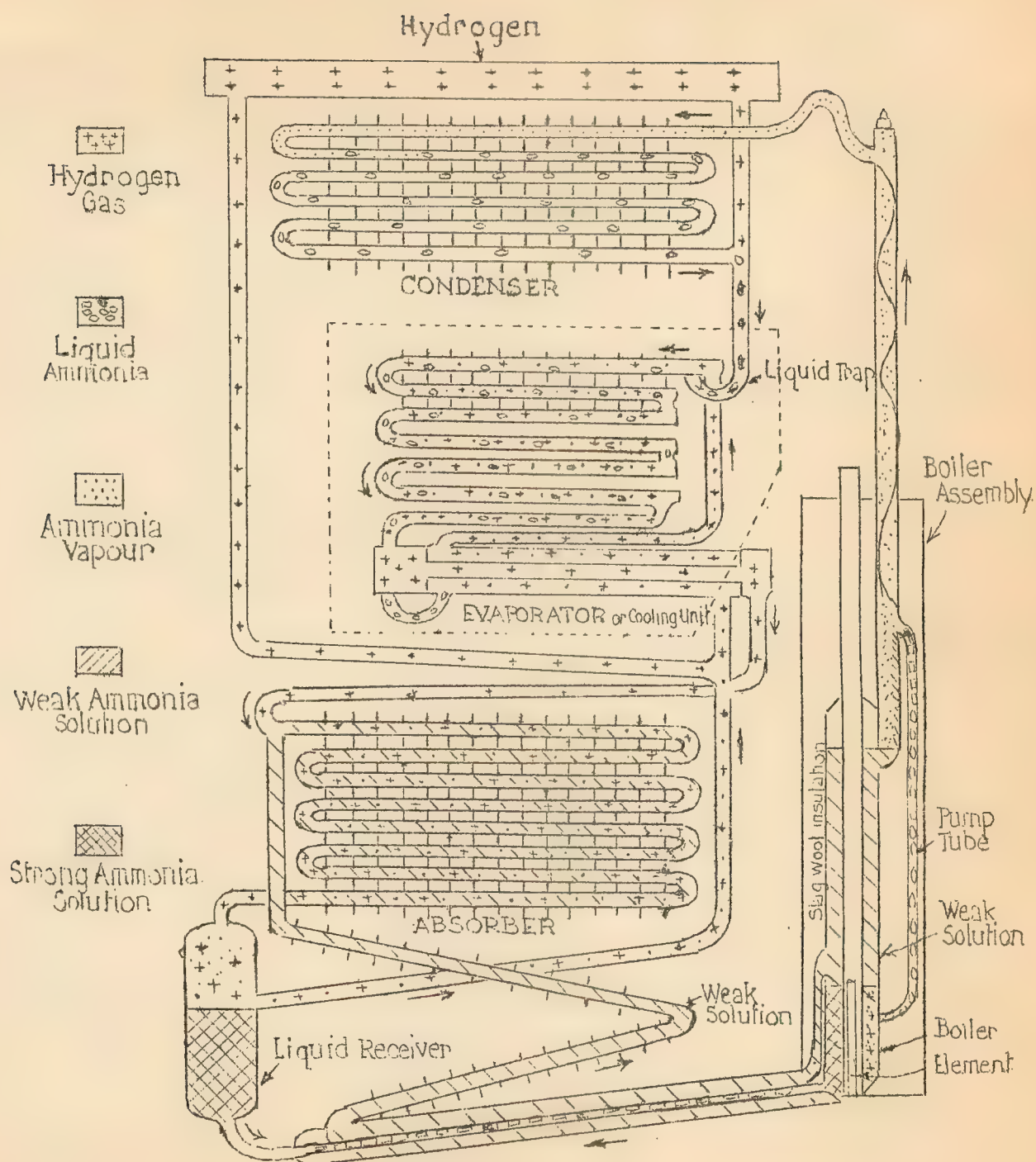


SIMPLE COMPRESSION SYSTEM

FIG. 1

EIGHT

EIGHT



TYPICAL ABSORPTION REFRIGERATOR SYSTEM

FIG. 2

REFRIGERATION.

ITEM NO. 4. AMMONIA CONDENSING UNITS.

Large numbers of automatic or manually controlled condensing units will be found in butchers' shops and other installations where refrigeration is required for the preservation of large quantities of foodstuffs.

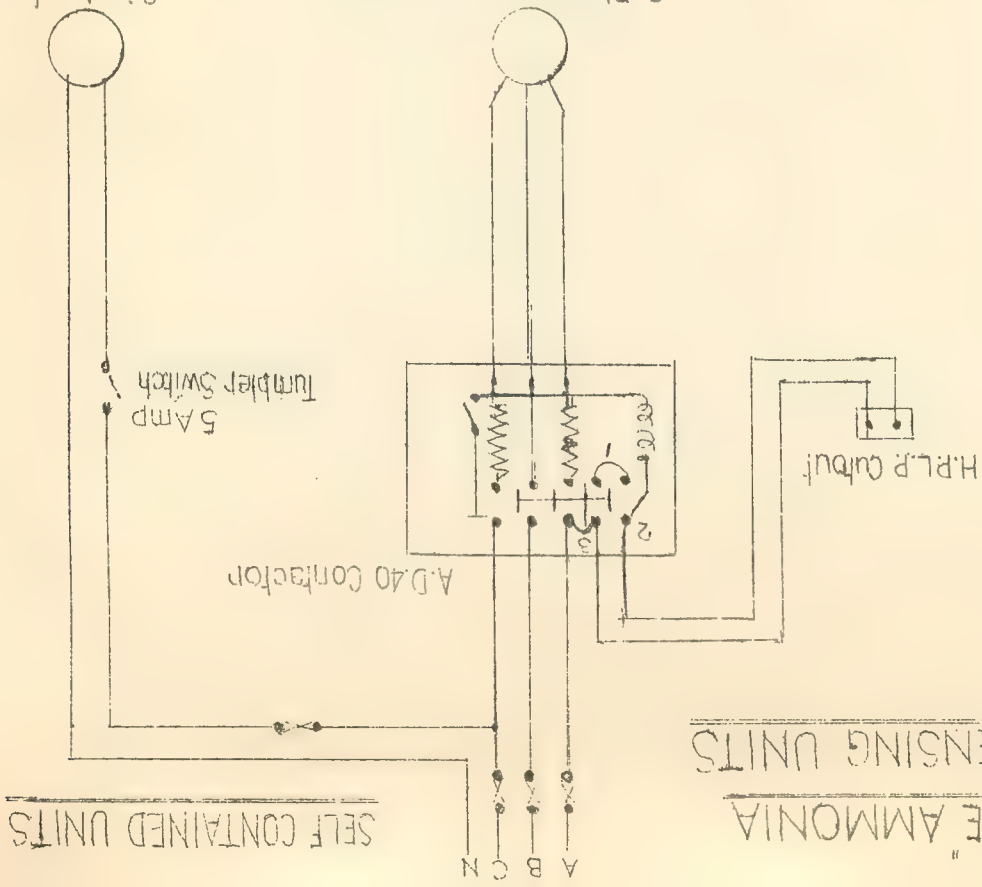
Wiring diagrams of ammonia condensing units manufactured by James Budge Pty.Ltd., Alexandria, are attached.

The "self contained" units are typical of the smaller installations, the "multiple circuit" unit where two coolers are in use, and the unit incorporating a compressor motor and an evaporative condenser motor, on the larger installations.

Usually, the thermostat is located inside the cooler, the solenoid valves outside the cooler, and the high pressure cut-out (automatic reset) on the unit itself, adjacent to the gauge.

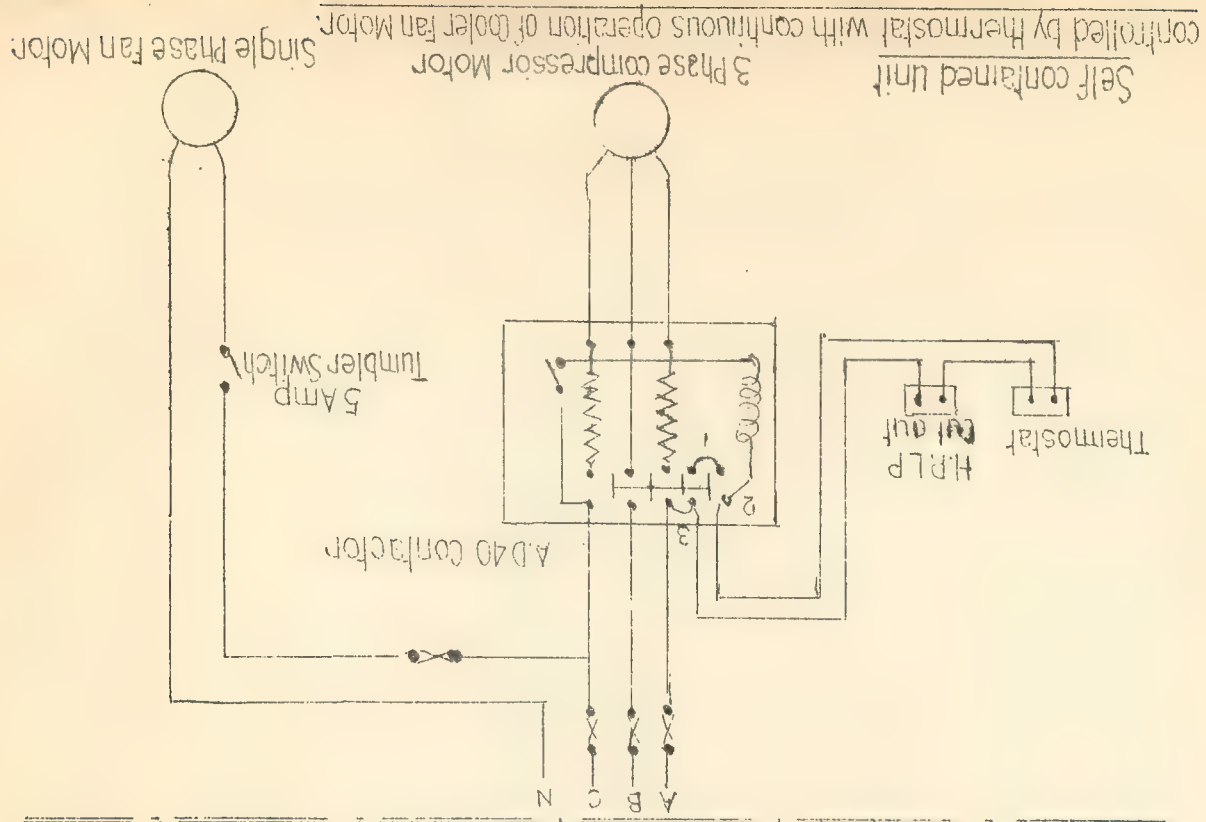
The units commonly in use range from $\frac{1}{2}$ to $3\frac{1}{2}$ tons capacity with electric motors ranging from $2\frac{1}{2}$ to 10 H.P.

CONDENSING UNITS



3 Phase compressor
Motor
Single phase fan motor
Self contained unit controlled by LP cutout with continuous operation of

Cooler Fan Motor.



Self contained unit

Self contained Unit
3 phase compressor Motor
controlled by thermostat with continuous operation of Cooler Fan Motor.

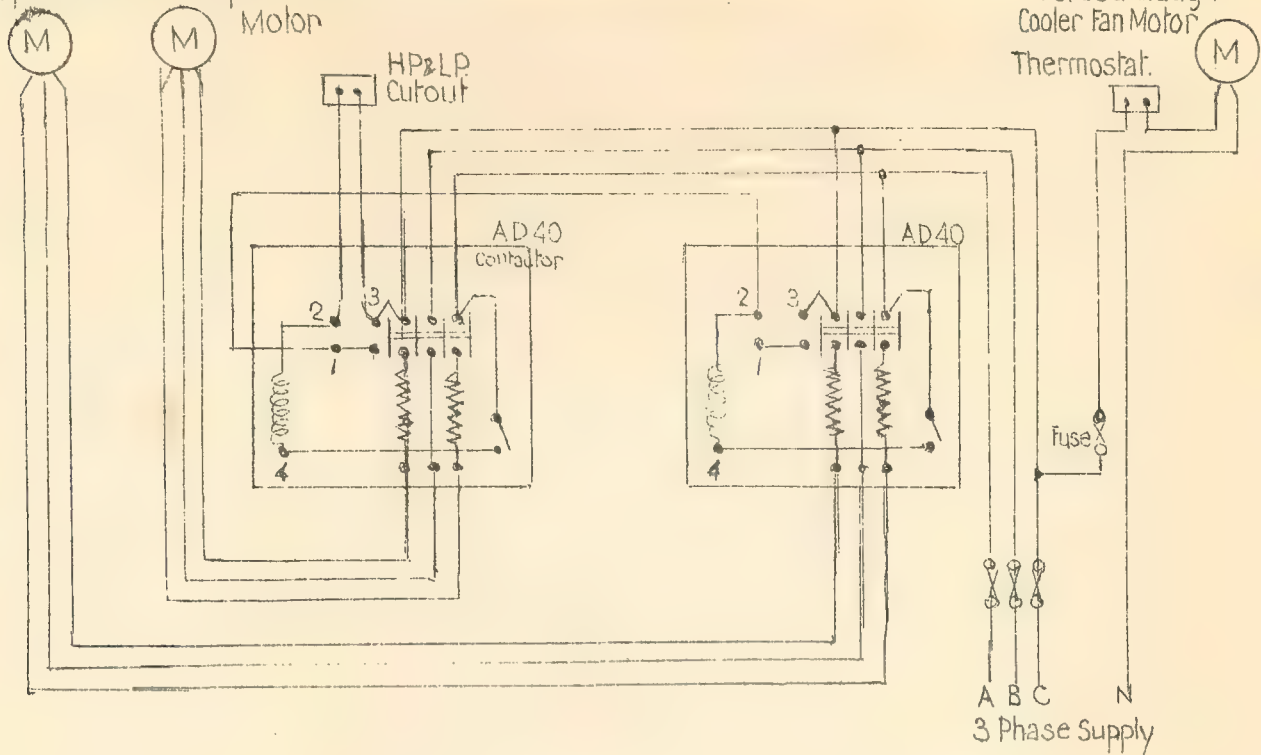
3 phase compressor Motor

Single phase Fan Motor:

3 PHASE MOTOR WITH EVAPORATIVE CONDENSER

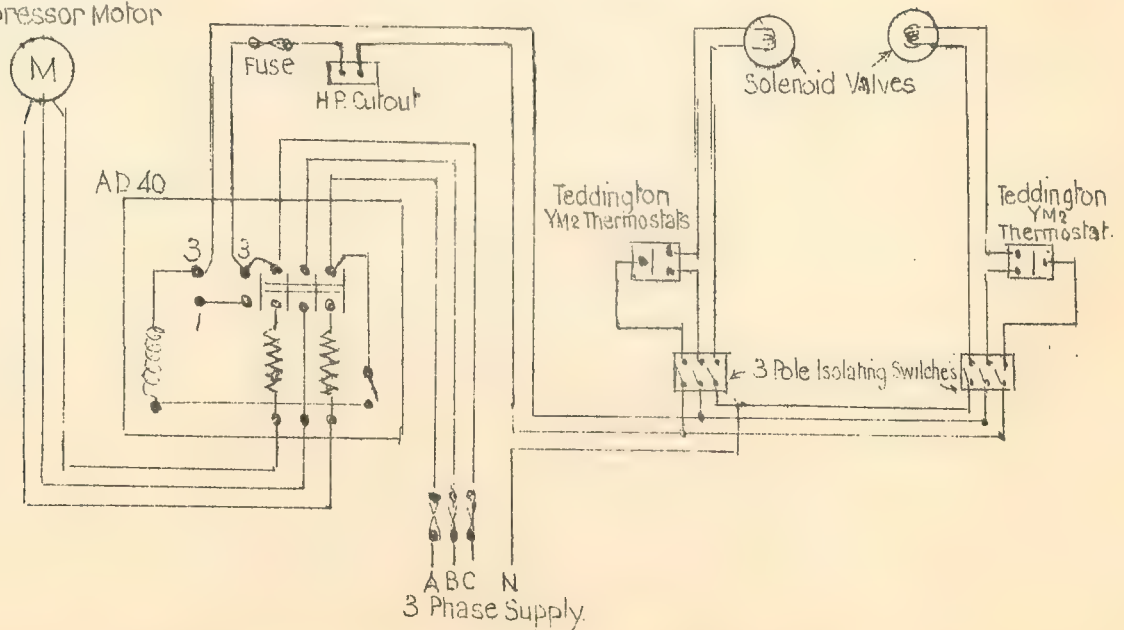
415 Volt 3 Phase Compressor Motor 415 Volt 3 Phase Evaporative Condenser Motor

Forced Draught Cooler Fan Motor
Thermostat:



MULTIPLE CIRCUIT WITH YM2 THERMOSTATS AND SOLENOIDS

415 Volt 3 Phase Compressor Motor



"BUDGE" AMMONIA CONDENSING UNITS

SECTION NO. 6.

WASH BOILERS AND INSTANTANEOUS THREE
PHASE WATER HEATERS.

- Item No. 1. Wash Boilers.
2. Instantaneous Three Phase Water Heaters.
3. Simplex Instantaneous Heaters.
-

SECTION NO. 6.

WASH BOILERS AND INSTANTANEOUS THREE PHASE WATER HEATERS.

ITEM NO. 1. WASH BOILERS.

1. Wash boilers may be classified as:-

- (a) On hire from the Sydney County Council.
- (b) On hire purchase from the Sydney County Council.
- (c) Privately owned.

They will be serviced by the Appliance Repair Section subject to the conditions as set down in Section No. 1 of this Handbook headed Servicing of Electrical Apparatus by the Sydney County Council.

ITEM NO. 2. INSTANTANEOUS THREE PHASE WATER HEATERS.

When a service call is received for an instantaneous three phase water heater either manually or automatically operated, the Emergency Service Officer shall check the electric supply to the heater.

If the heater itself is found defective and is a Non-Council sale, the customer shall be referred to the manufacturer or agent both during and after the guarantee period.

The Appliance Repair Section will service Council sales only during the guarantee period.

Emergency Service Officers shall repair broken wiring connections or defective control switches if possible. If it is not possible to effect repairs the customer shall be referred to a contractor or to the manufacturer or agent as is necessary.

ITEM NO. 3. SIMPLEX ELECTRIC INSTANTANEOUS HEATERS.

Simplex Instantaneous Heaters are manufactured in two types:

- (1) Automatic Type (Series A)
- (2) Manual Control Type (Series B)

Both types are 3 phase 415 volts with loadings of 18 amps. per phase or 12 amps. per phase.

The Elements are contact type and are connected in delta.

The resistance to earth is over 25,000 ohms. The resistance of early models to earth is over 10,000 ohms.

ITEM NO. 4. AMMONIA CONDENSING UNITS.

Large numbers of automatic or manually controlled condensing units will be found in butchers' shops and other installations where refrigeration is required for the preservation of large quantities of foodstuffs.

Wiring diagrams of ammonia condensing units manufactured by James Budge Pty.Ltd., Alexandria, are attached.

The "self contained" units are typical of the smaller installations, the "multiple circuit" unit where two coolers are in use, and the unit incorporating a compressor motor and an evaporative condenser motor, on the larger installations.

Usually, the thermostat is located inside the cooler, the solenoid valves outside the cooler, and the high pressure cut-out (automatic reset) on the unit itself, adjacent to the gauge.

The units commonly in use range from $\frac{1}{2}$ to $3\frac{1}{2}$ tons capacity with electric motors ranging from $2\frac{1}{2}$ to 10 H.P.

SECTION NO. 7

METERING

- | | | |
|----------|-----|---|
| Item No. | 1. | Reading of Kilowatt Hour Meters. |
| " " | 2. | Reading of Thermal Demand Meters (Non Recording). |
| " " | 3. | Reading of Recording Demand Meters. |
| " " | 4. | Resetting of Maximum Demand Indicators. |
| " " | 5. | Reporting Defects in Meters and Maximum Demand Indicators. |
| " " | 6. | Method of Joining Wires to Bridge Out Meters and Maximum Demand Indicators. |
| " " | 7. | Sealing of Meters and Maximum Demand Indicators. |
| " " | 8. | Handling of Lincoln Maximum Demand Indicators. |
| " " | 9. | Creeping Meters. |
| " " | 10. | Noisy Meters. |
| " " | 11. | Open-circuited Meters. |
| " " | 12. | Broken Meter Glasses. |
| " " | 13. | Meters With Energised Cases. |
| " " | 14. | Meters Not Registering. |
| " " | 15. | Check of Unidentified Meters. |
| " " | 16. | Unmetered Supply Where Meters Have Been Removed. |
| " " | 17. | Excessive Registration of Maximum Demand Indicators.
1. Responsibility for Resetting.
2. Excessive Registration Reported by Customer.
3. When Faults are Discovered.
4. When Maximum Registration is Noticed. |
| " " | 18. | Connection of Additional Apparatus. |
| " " | 19. | Final Meter Reading After Hours. |
| " " | 20. | Current Transformers.
1. Types of Current Transformers used by The Council.
2. Description.
3. Open - Circuited Secondary Windings of Current Transformers.
4. Current Transformer Secondary Circuits Found Open - Circuited. |

Item No. 20. Current Transformers (cont'd).
5. Energised Meter Cases.
6. Reporting of Short - Circuited Secondary Windings
" " 21. Installation of Combined Energy kW Demand Meters.

INTRODUCTION.ITEM NO. 1 - READING OF KILOWATT HOUR METERS.

Stand directly in front of the meter. Commence reading from the right hand unit dial. Read each dial pointer to the left in succession, recording the figures in the same order as read.

When the dial pointer is between two numbers, record the lower of the two numbers. If it is doubtful whether the dial pointer has actually passed a figure or not, check whether the next dial pointer to the right has passed the zero position, remembering that no dial pointer has completed a division until the dial pointer next on the right has completed a revolution.

Where a multiplying constant greater than 1 is provided, the reading returned shall be the direct reading of the meter, and the constant or constants shall be stated. The constant is indicated either on the dial or on a constant tag attached to the meter sealing stud, e.g.: - "Multiply by 120" or "120". The fractional dials are not to be read unless instructions to do so are given.

ITEM NO. 2 - READING OF THERMAL DEMAND METERS (FOR RECORDING).

Check the value of the scale divisions.

Stand directly in front of the meter when reading.

Read only the ampere scale of single phase demand meters.

Where the pointer lies between two adjacent marks on the scale, the reading returned shall be that at the next mark on the scale below the pointer, but where the pointer actually covers a mark, the reading shall be returned at that mark.

Where the pointer actually covers the maximum numbered mark on the scale, the reading shall be returned at the maximum numbered mark on the scale with the addition of the word "FULL", e.g.: - Where the pointer of a demand meter having a full scale of 10 amperes actually covers the 10 ampere mark, the reading shall be returned as 10 amperes FULL.

Where the pointer is in a position above the maximum numbered mark on the scale, the reading shall be returned as the maximum numbered mark on the scale, with the addition of the words "Above Scale" or "A.S.", e.g.: - "12 amperes Above Scale" or "12 amperes A.S."

Where the pointer actually covers the minimum numbered mark, other than zero, on the scale, the reading shall be returned at that mark.

Where the pointer is in a position below the minimum numbered mark, other than zero, on the scale, the reading shall be returned as the minimum numbered mark on the scale, with the addition of the words "Below Scale" or "B.S.", e.g.: - "2 amperes Below Scale" or 2 amperes "B.S."

METERING.

Where the multiplying constant greater than 1 is provided, the reading returned shall be the direct reading of the meter, and the constant or constants shall be stated. The constant is indicated either on the dial or on a constant tag attached to the meter scaling stud, e.g.:-- "Multiply by "30" or "K30".

ITEM NO. 3 - READING OF RECORDING DEMAND METERS.

The chart shall be removed to obtain the reading. The value of the scale divisions shall be checked.

Where the indicated demand actually covers a mark on the chart, the reading shall be returned at that mark.

Where the indicated demand lies between two adjacent marks on the chart, the reading returned shall be that at the next one-tenth of the division below the indicated value.

Where a greater constant than 1 is provided, the reading returned shall be the direct reading of the meter, and the constant shall be stated.

ITEM NO. 4 - RESETTING OF MAXIMUM DEMAND INDICATORS.

Maximum Demand Indicators will be reset by Emergency Service Officers only when supply is being connected for a new customer.

They will not be reset when replacing service fuses after repairs, or after disconnection for default of money due to The Sydney County Council.

Maximum Demand Indicators are reset annually by Meter Readers during the months of May, June, July or August.

ITEM NO. 5 - REPORTING DEFECTS IN METER AND MAXIMUM DEMAND INDICATORS.

Unless already aware of the defective condition of a meter or Maximum Demand Indicator, the customer will not be informed that the matter is being reported for further attention.

Officers reporting a defective energy meter or Maximum Demand Indicator will show the following details on Service Reports:--

- (a) Probable cause of damage to meter or Maximum Demand Indicator.
- (b) S.C.C. number of meter or Maximum Demand Indicator.
- (c) Rating in amperes of the instrument.
- (d) Name of manufacturer.
- (e) Type.
- (f) Reading.
- (g) Action taken. Whenever unmetered supply is given, care must be taken to indicate the fact.

METERING.

ITEM NO. 6 - METHOD OF JOINING WIRES TO BRIDGE OUT METERS AND MAXIMUM DEMAND INDICATORS.

Remove and if necessary, clean the wires and join them through an insulated connector. Each connector will be effectively insulated with friction tape.

If a connector is not available, or the wires will not fit into the connector, lay the wires together and bind them securely with 20 gauge fuse wire and tape the joint.

In no circumstances will officers join wires by twisting the ends together as this may result in the wires being broken when they are being untwisted, and so left too short to permit of their reconnection.

ITEM NO. 7 - SEALING OF METERS AND MAXIMUM DEMAND INDICATORS.

The Sydney County Council does not "earth" the metal cases of energy meters or Maximum Demand Indicators.

Each piece of metering equipment must be sealed separately.

In no case shall separate metal cases be connected together by means of wire and sealed with one seal.

When sealing Maximum Demand Indicators, officers must use the special sealing ring provided. If the sealing pins are missing or damaged, the details are to be shown on Service Reports.

The sealing pins were introduced to prevent manipulation of the resetting device by unauthorised persons.

ITEM NO. 8 - HANDLING OF LINCOLN MAXIMUM DEMAND INDICATORS.

Shocks, blows or severe vibration may cause the indicating hand of Lincoln Maximum Demand Indicators to move and thus give a wrong indication.

Care must be taken when removing seals from these instruments to do so by cutting the sealing wire and carefully extracting it. Tearing the wiring away with pliers must be avoided.

It is important also that the meter board for Lincoln Maximum Demand Indicators should be firmly fixed and that the bottom fixing screw of the Indicator should be tight.

Lincoln Maximum Demand Indicators must not be fixed to frail partitions.

Customers sometimes complain to Emergency Service Officers visiting their premises that the meter is registering with supply switched off, or that the electricity account appears to be excessive.

Emergency Service Officers will not on any occasion discuss customers' accounts with them.

If the meter appears to be creeping, or the customer complains that the meter appears to be constantly registering, open the customer's main switch and withdraw the load side lead from the meter.

Check the meter disc for creep. The creep may be either in a forward or reverse direction, but the meter disc must make more than one complete revolution before the meter is said to be creeping. Check the main switch only is not sufficient as the insulation of the customer's control gear may be of low value.

If the meter disc comes to a standstill without making more than one revolution, assure the customer that the meter does not creep.

If the meter is obviously creeping, do not discuss its condition with the customer but reconnect the meter and report accordingly.

It may be found on proving the meter to be functioning correctly that, on restoring to normal and closing the main switch, the meter begins to creep.

If this occurs, ascertain if all the appliances and lights have been switched off. Be careful to check for connection of bell ringing transformers, electric clocks or other small power consuming apparatus.

Numerous pieces of this type of apparatus, if badly designed, are such places, may be sufficient to cause the meter to register when all lights and other appliances have been switched off. These facts are often overlooked by the customer.

Sometimes a customer observes the meter registering at a time when all lights and apparatus have been switched off and so forms the opinion that the meter is defective. However, a meter not may have been left switched on with its own lamp lit and the volume turned down very low or the broadcasting station in question is completed.

If, despite the precautions outlined above, the meter still registers when all lights and appliances are disconnected, test the installation for an insulation defect.

When the noise is a source of immediate inconvenience and an occupant of the premises is ill, the bill will be given the same price as that of a Hospital or Doctor.

In other cases when a noisy meter requires the attention of an Emergency Service Officer, the job will be attended in the same priority as that of a domestic customer, or earlier should an Emergency Service Officer be attending at premises nearby.

When an Emergency Service Officer visits a customer's premises to inspect a noisy meter and in his opinion the noise is not sufficient to warrant replacement of the meter, he will endeavour to assure the customer of the safety and correct operation of the meter.

If the officer decides that the noise is objectionable, or if he is unable to reassure the customer, he will disconnect the shunt circuit of the meter by moving the shunt link to the "open circuit" position.

If it is not possible to move the shunt link, the officer will remove the neutral connections only. In the case where four wires are connected to a meter it is necessary to bridge the two neutral wires after disconnection.

ITEM NO. 11 -- OPEN-CIRCUITED METERS.

When a meter is found to be open-circuited, Emergency Service Officers will remove only the connections affected and give unmetered supply.

ITEM NO. 12 -- BROKEN METER GLASSES.

No charge is made for attention to broken meter glasses unless proof of malicious damage is forthcoming.

Emergency Service Officers, when noticing broken meter glasses will enter all information available on a Service Report.

ITEM NO. 13 -- METERS WITH ENERGISED CASES.

When a meter is found with the case energised, Emergency Service Officers will remove the case connections only and give unmetered supply.

ITEM NO. 14 -- METERS NOT REGISTERING.

When a customer complains to an Emergency Service Officer visiting the premises that a meter is not registering, the officer will check the meter.

If it is not registering he will leave the meter as found and record details on a Service Report.

The officer will advise the customer that the matter will be reported for attention.

ITEM NO. 15 -- CHECK OF INSTALLATION.

On premises where several meters are installed the meters should do not bear any marks identifying them with any control apparatus of a particular customer's installation.

In such cases it is not safe to assume that the meters are erected in the same order as the control apparatus of the various customer's installations.

When no supply is being received at the control apparatus of a customer's installation, each meter must be checked until it is established which meter controls the supply to the customer concerned. Should supply be disconnected at the meter, the fact will be revealed immediately if this check is carried out.

ITEM NO. 16 - UNMETERED SUPPLY WHICH HAS HAD METER REMOVED.

Usually, meters are removed only after premises have remained disconnected for twelve months or more.

When an Emergency Service Officer visits premises at any hour for the purpose of reconnecting supply and it is discovered that the meters have been removed, the officer may give unmetered supply after inspecting the installation and finding it to be in order.

ITEM NO. 17 - EXCESSIVE REGISTRATION OF MAXIMUM DEMAND INDICATORS.

(i) Responsibility for Resetting.

The Chief Installation Inspector is responsible for the correct method of metering customers' installations. He will decide whether Maximum Demand Indicators will or will not be reset. He will arrange for any correspondence with customers on the subject.

(ii) Excessive Registration Reported by Customer.

When a customer complains to an Emergency Service Officer of an excessive registration of a Maximum Demand Indicator alleged to have been caused by faults on the installation or apparatus at some time prior to the visit of the Emergency Service Officer, the customer will be advised to write a letter to the General Manager giving the following information:-

- (a) Nature of fault.
- (b) Date fault occurred.
- (c) Name of Electrical Contractor or other person
who removed the fault or repaired the apparatus
alleged to have caused the excessive registration.

(iii) When Faults Are Discovered.

When an Emergency Service Officer visiting a customer's premises discovers faults and the customer expresses the opinion that the faults have caused an increase in registration of the Maximum Demand Indicator, he shall obtain all information concerning the case.

The customer will be informed tactfully that the occurrence will be reported and that a communication will be received from The Sydney County Council at a later date.

(iv) When Maximum Registration Is Noticed.

When an Emergency Service Officer notices that a Maximum Demand Indicator has reached its maximum registration due to no apparent reason or the cause is believed to be due to a fault or suspected overload, the details will be reported.

NOTE. The Sydney County Council must not be committed to reset a Maximum Demand Indicator when a customer complains of excessive registration nor will the impression be given that a customer will receive favourable consideration.

ITEM NO. 18 - CONNECTION OF ADDITIONAL APPARATUS.

It is sometimes necessary in emergency to connect additional apparatus temporarily to customers' installations.

When this is necessary, the Maximum Demand Indicator (if any) must be bridged out before connecting the additional load.

The usual routine governing the reporting of bridged Maximum Demand Indicators must be followed.

ITEM NO. 19 - FINAL METER READINGS AFTER HOURS.

If a customer requests that the Final Reading be taken outside of general working hours for some special reason which prevents the reading being taken during working hours, the address to which the account may be forwarded will be obtained from the customer and arrangements will be made for an Emergency Service Officer to read the meter subject to satisfactory proof that the person making the request is the customer of The Sydney County Council.

If the premises are being left vacant, supply will be disconnected.

If the premises are being re-occupied, supply will not be disconnected but the Emergency Service Officer will record on a Service Report the available information as to the name and previous address of the new occupant and request the new occupant to communicate with The Sydney County Council on the next general working day.

ITEM NO. 20 - CURRENT TRANSFORMERS.

Description.

A current transformer consists of a primary and a secondary winding on a laminated iron core. The primary winding is connected in the main supply circuit to the customer. The secondary winding is connected to the meters and is not electrically connected to the main circuit.

Secondary Circuits.

Under no circumstances should the secondary current wiring be open circuited while current is flowing in the primary winding.

METERING.

The effects of such procedure would be possible over magnetisation of the iron core with consequent effects on the accuracy of the current transformer, and also the existence of fairly high voltages across the secondary leads.

Unmetered Supply.

Unmetered supply due to a defect in the main circuit connections is given by bridging out the primary connections.

If the defect is in the primary winding, the primary winding must first be disconnected from the conductors before bridging.

The secondary current wiring to the meters or metering connections should not be touched.

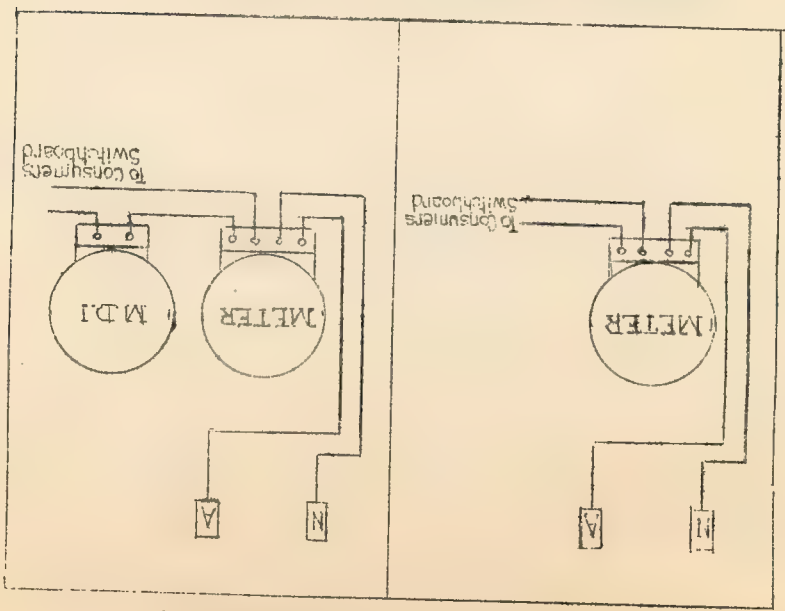
If difficulty be experienced in bridging out the primary connections, Emergency Service Officers will contact the Despatch Officer who, during ordinary working hours, will arrange for attention by the Meter Branch. Outside ordinary working hours, the Despatch Officer will arrange if necessary for attention by the Meter Branch through the System Operator.

Energised Meter Cases.

On current transformer installations Emergency Service Officers will remove the potential fuse or remove and tape the active conductor from a meter found to have the case energised.

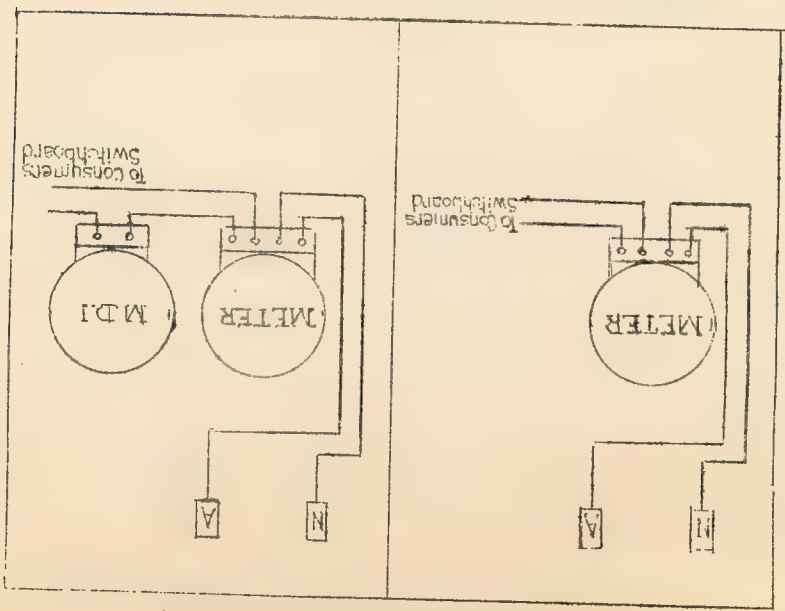
The details of meter and time and date of disconnection should be clearly shown on the Service Report.

NO. 1
METER ONLY.



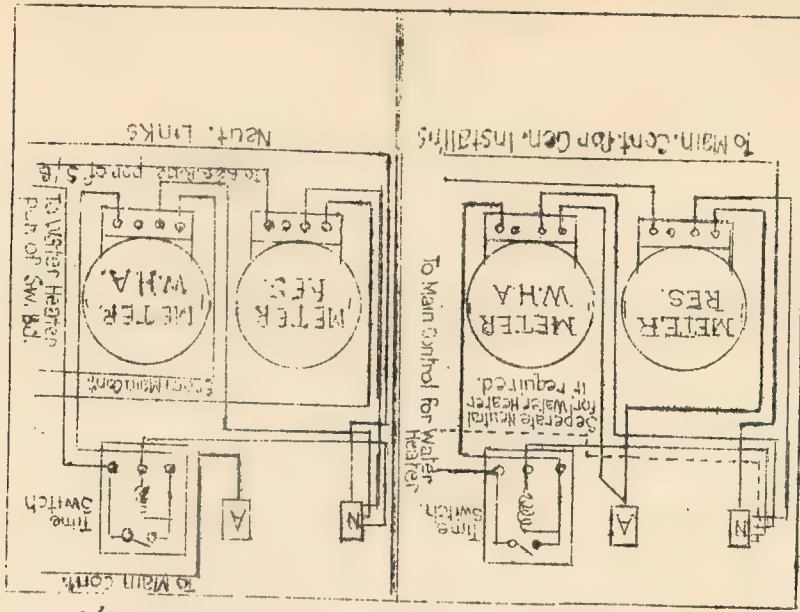
METERING DIAGRAMS NOS. 1 AND 2.

NO. 2
METER AND
MAXIMUM DEMAND
INDICATOR.

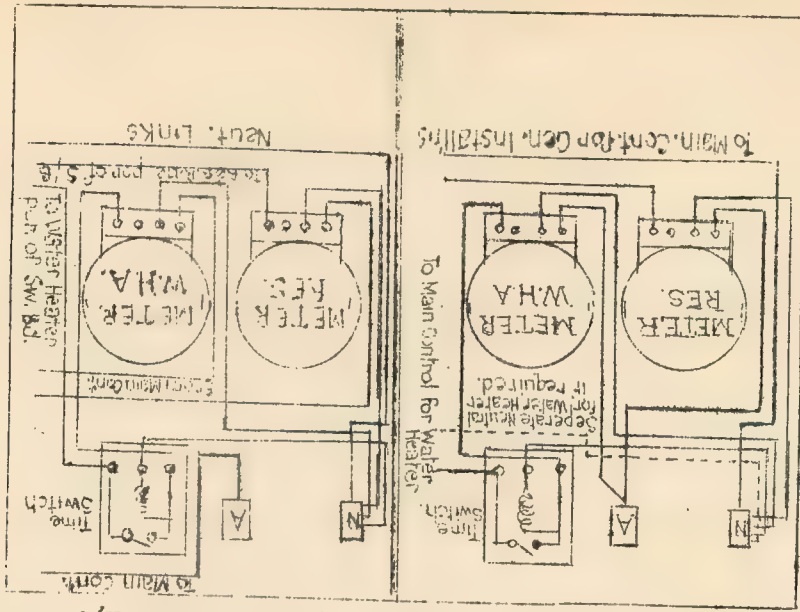


A.C. 240 Volt Single Phase Supply, 50 Ampere
(Supply from one Phase and Neutral).

No. 5
Residence Rate and Water
Heating Rate where
Customer's Switchboard
has separate Main Controls.
(Master Switch).



No. 6
Residence Rate and Water
Heating Rate where Customer's
Switchboard has one Main Control
(Master Switch).



Where a rate other than Residence Rate applies to the installation and a Maximum Demand Indicator is installed, this instrument will be connected on the load side of the Meter, marked "Res". Rate in Diagrams. The same method of connection will be used in all cases where two portions of an installation are separately metered for the same or for a different consumer.

METERING DIAGRAMS NOS. 9 AND 10.

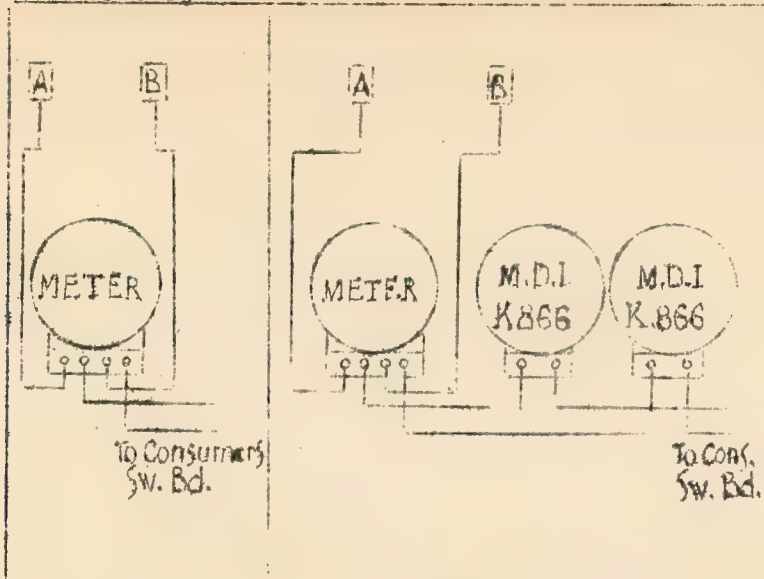
A.C. 415 VOLT SINGLE PHASE SUPPLY, 50 AMPERE.
(Supply from 2-Phase Conductors).

No.9

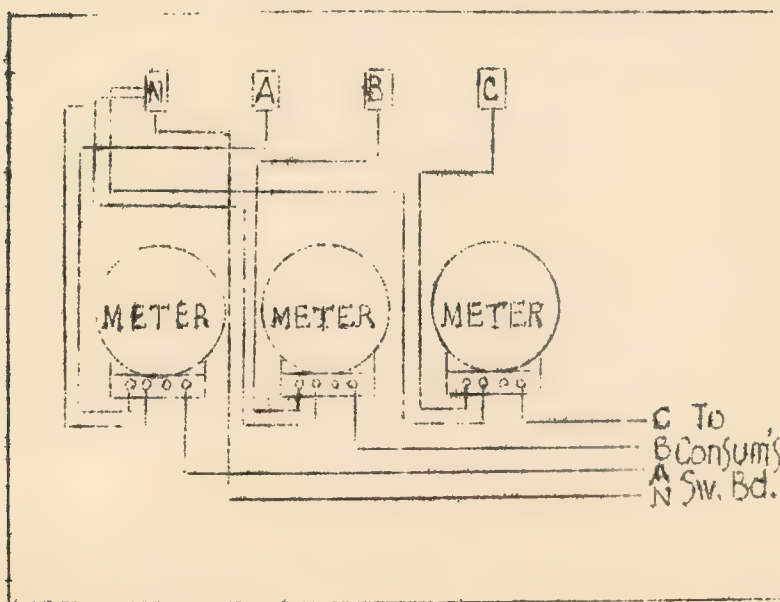
Meter only

No.10

Meter and Maximum Demand Indicator.



These Diagrams apply to the metering of 415 volt single phase apparatus such as Welders, X-Ray Plant, etc. when they form the only (or principal) load on the service and are separately metered.



METERING DIAGRAM
NO. 11.

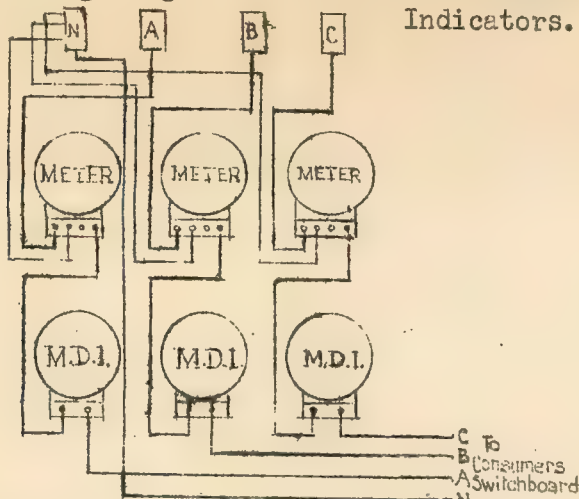
A.C. 415/240 Volt
3-Phase 4-Wire
and 2-Phase 3-Wire,
Using Single Phase
Meters.

This Diagram applies to 2-phase and 3-phase installations supplied from a 3-phase system. Where only a 2-phase supply is provided, all connections shown to "B" Phase should be disregarded.

This Diagram may also apply where a number of separately metered portions of an installation are supplied from the one metering position. (Where there are more than 3 Meters, a connector box will be used for the connection of neutral conductors to Meters.

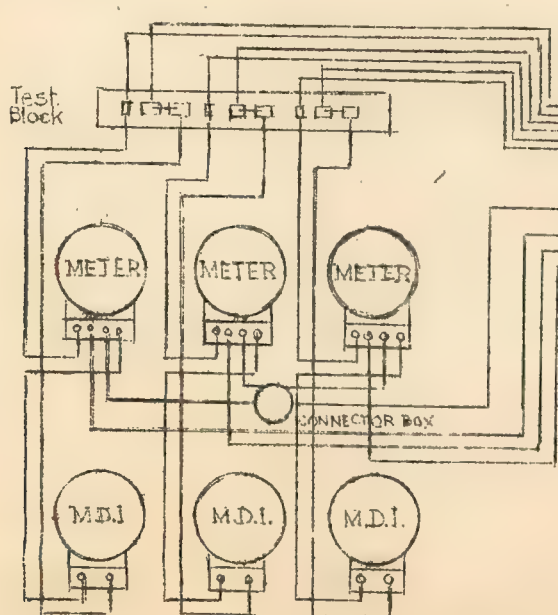
METERING DIAGRAM NO. 12.

A.C. 415/240 Volt 3-Phase, 4 Wire or 2 Phase 3-Wire Using Single Phase Meters and Maximum Demand Indicators.



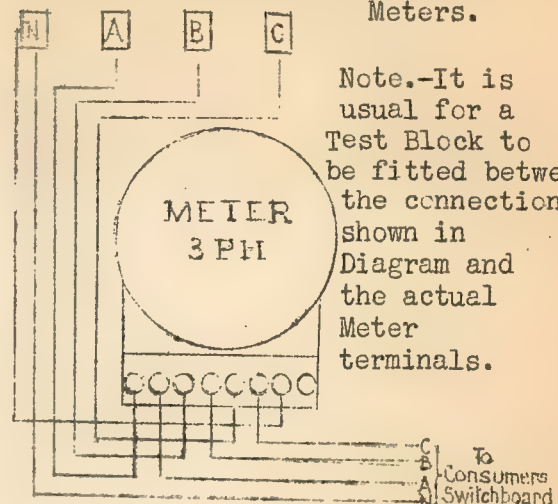
This Diagram applies to 2-phase and 3 phase installations supplied from a 3-phase system. Where only a 2-phase supply is provided, all connections shown to "B" phase should be disregarded.

This Diagram may also apply where a number of separately metered portions of an installation are supplied from the one metering position.



METERING DIAGRAM NO. 13.

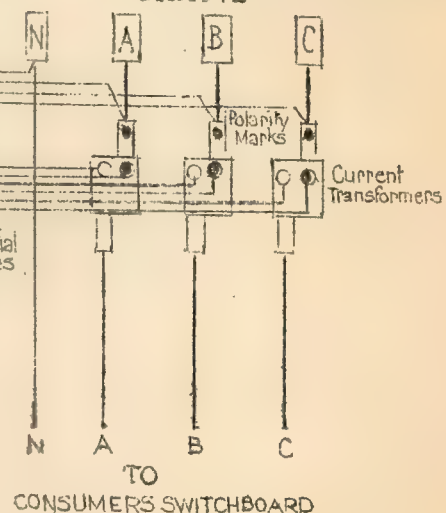
A.C. 415/240 Volt 3-Phase, 4-Wire or 2-Phase 3-Wire, Using 3 Phase Meters.



Note.—It is usual for a Test Block to be fitted between the connections shown in Diagram and the actual Meter terminals.

This Diagram applies to 2-phase and 3-phase installations supplied from a 3-phase system. Where only a 2-phase supply is provided, all connections shown to "B" phase should be disregarded.

SERVICE



METERING DIAGRAM NO.15.

A.C.415/240 Volt Supply Requiring the Use of Current Transformers.

REVENUE ACCOUNTS

1. 1911-12

2. 1912-13

3. 1913-14

4. 1914-15

METERING DIAGRAMS NOS. 21 AND 22.

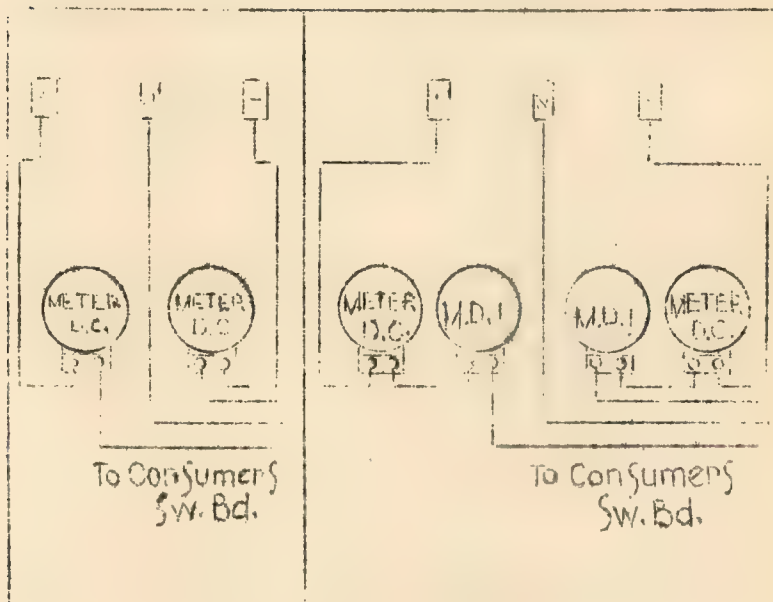
D.C. 480 Volt (3-Wire) Supply.

No. 21.

No. 22.

Meters Only

Meters and Maximum
Demand Indicators.



These Diagrams apply to the metering of all 480 Volt 3-wire installations, but where more than one installation is to be metered at the one metering position, connecting links must be provided.

ITEM NO.21 - INSTALLATION OF COMBINED ENERGY
KW DEMAND METERS

In connection with the proposed change from the kVA to the kW demand tariff which is to take effect on the 1st January, 1964, it is proposed to commence in the near future, the installation of combined energy - kW demand meters so that readings of block-interval kW and thermal kVA demand can be obtained to enable an appropriate kW demand tariff to be determined. In this regard, fifty (50) combined energy-kW demand meters, S.C.C. Type L.G./E.D, manufactured in Switzerland by Landis and Gyr, will be installed on fifty (50) low voltage current transformer installations specially selected by the Chief Installation Inspector. These meters will replace the existing energy meters, but the thermal demand meters will be retained for the present.

The arrangement of the Type L.G./E.D. meter is such that the customer's energy consumption is indicated on the top, or larger, cyclometer register, marked "kWA". This register has four (4) "reading" drums and one (1) fractional or decimal drum coloured red. As the meters are not arranged for direct reading, an external reading constant is applied according to the current transformer ratio. This constant is marked on a reading constant tag attached to the dial of the meter. For example, in the case of a meter used with 300/5 current transformers the tag is marked "k=60", whereas in the case of 800/5 current transformers it is marked "k=160".

The maximum kW demand is indicated by an "idle" pointer which is driven around a graduated circular scale by an "active" pointer. The "active" pointer is automatically reset to zero each half hour. The "idle" pointer is intended to give an indication only of the demand and must not be used for determination of the chargeable maximum demand. The chargeable maximum demand is determined from the reading of the lower, or smaller, cyclometer register, which is marked "kW". This register has four (4) drums which indicate tens, units, tenths and hundredths respectively. The last two (2) drums, i.e. the tenths and hundredths drums, are coloured red. In addition, a decimal point is marked between the units and tenths drums. It is necessary that all drums, including the decimal drums, be read and that the reading constant, which is the same as the reading constant for the energy portion of the meter, be applied.

The procedure for determining the customer's maximum demand is as follows:

- (i) Read and record the registration of the kW cyclometer register.
- (ii) Unseal the resetting device located at the top right hand side of the meters.
- (iii) Turn the re-setting device in a clockwise direction until the reset mechanism is engaged which is obvious from the continuous "whirring" noise made by the mechanism when in operation.

ITEM NO. 21 (CONT'D)

- (iv) Observe that the "idle" pointer has returned to the zero position and that the kW register has advanced from the previous reading.
- (v) Read and record the new registration of kW register.
- (vi) The customer's maximum demand in kW is then calculated from the difference between the final and initial readings of the kW register, multiplied by the marked reading constant, e.g.,

Initial reading = 42.16kW
 Final Reading (after reset) = 44.38kW
 Difference between initial and final readings = 2.22kW
 $k = 80$ (i.e. 400/5 CT'S)
 Maximum demand = $2.22 \times 80W$
 = 177.6kW
- (vii) Reseal the resetting device.

With regard to the installation and disconnection of Type L.G./E.D. meters, the metering connections are identical with those of the Emmco Type 3 phase, 4 wire meter in common use at the present time. A diagram of connections is marked on the inside of the terminal cover. It is not necessary for the demand integrating period to be set to commence at any specific time as the period of integration may be any period of thirty (30) minutes. Consequently, it will not be necessary for the meters to be adjusted following disconnections or interruptions to supply.

ITEM NO.

- 1 General
- 2 Time Switches Controlling "Off Peak" Rate "A" (Now Obsolete)
Storage Water Heaters.
 - 2.1 Metering.
 - 2.2 Types of Time Switches.
- 3 Time Switch Settings
 - 3.1 Standard Hours
 - 3.2 Alteration of Setting.
 - 3.3 Care to be Exercised.
 - 3.4 Schedule of Time Settings.
- ~~4 Manual Operation of Time Switches.~~
- 5 Cutting-In of Time Switches Which Involve Considerable Load.
- 6 Time Switches Other Than Sangamo Causing Unsatisfactory
Operation of Storage Water Heaters.
- 7 Time Switch Stopped.
- 8 Reporting Defects in Time Switches.
- 9 Method of Bridging Time Switches.
- 10 Sealing.
- 11 Defective Sangamo Time Switches.
 - 11.1 Method of Changing and Recording Changes of Time Switches.
 - 11.2 Adjustment and Reporting of Time Switch Settings.
 - 11.3 Privately owned Time Switches
- 12 Time Switches Controlling Supply on Restricted Hours Rate.
 - 12.1 Battery Charging.
 - 12.2 Metal Melting Rate.
 - 12.3 Process Heating Rate.

- 12.4 General Purposes.
 - 12.5 Checking Time Switch Settings.
 - 13 Time Switches Controlling Supply to Concrete Block Room Heaters
 - 13.1 General.
 - 13.2 Time Switch Settings.
 - 13.3 Concrete Block Room Heaters - Faults That May Occur.
 - 13.4 Replacement of Defective Time Switches.
 - 14 Adjustment of Time Switches Controlling Storage Water Heaters.
 - 15 Terminal Connections.
 - 16 Connection and Setting of A.E.G. Type.
 - 17 Connection and Setting of Sangamo Type "K.A."
 - 18 Connection and Setting of Type SS.AO.
 - 19 Connection and Setting of Newbridge Type NS.
 - 20 Connection and Setting of Venner Type VS.
 - 21 Connection and Setting of Siemens - Schuckert.
 - 22 Time Switches Used with 3-phase Contactors.
 - Description of Time Switch.
 - Description of Contactor
 - Checking of Contactor
 - Connections Diagrams.
 - 23 The Landis and Gyr K.Y.B.1 Dual Dial Time Switch For Off Peak or Extended Off Peak Water Heaters and Space Heaters.
- Appendix Wiring of Time Switches.

TIME SWITCHES

Section No. 8.

ITEM NO. 1 - GENERAL.

Where, in accordance with the provisions of any rate published by the Council, electricity is supplied only during certain hours, the Council provides time control equipment so that electricity to be charged for at the rate may be used only during the hours specified in respect to that rate.

The time control equipment supplied by the Council is capable of controlling directly single-phase, two-phase or three-phase loads up to a rating of 30 amperes per phase.

Where the load is in excess of 30 amperes per phase, a contactor is supplied and installed by the customer. This contactor is controlled by the Council's time switch or relay and is sealed. The customer provides the wiring between the contactor and the Council's time switch or relay.

Where supply is taken from only one phase and the demand is not more than 15 amperes, the Council supplies a 15 ampere time switch.

Where the demand is in excess of 30 amperes from one, two or three phases, the Council supplies a 15 ampere time switch or relay only to control the customer's contactor.

Where supply is taken from two or three phases and the demand per phase does not exceed 30 amperes or if supply is taken from only one phase and the demand is more than 15 amperes but not more than 30 amperes, the Council supplies a 15 ampere time switch and an auxiliary control relay.

The auxiliary control relays, type A.C.R. will generally consist of type iii (c) or iv (c). Type iii (c) is a three-pole relay with an internal terminal to which the active supply from the time switch will be taken. Type iv(c) is similarly fitted with an internal active terminal but is of a four-pole type, the fourth pole being of use for the control of additional banks of water heaters in large installations such as in flats.

The installation, operation and adjustment of the makes of time switches installed by the Council are described in this Section.

TIME SWITCHES.

2.

ITEM NO. 2 - TIME SWITCHES CONTROLLING "OFF PEAK" (RATE "A" NOW OBSOLETE) STORAGE WATER HEATERS

1. METERING OF "OFF PEAK" STORAGE WATER HEATERS.

Electricity is supplied at the Water Heating (OFF PEAK or extended OFF PEAK) Rate to customers of the Sydney County Council when the heating element in the reservoir complies with S.C.C. requirements as described in new S.C.C. Specification dated 24th February, 1969, and located in Section 3 Storage Water Heaters. Supply to these installations is metered separately and controlled by a time switch or relay supplied and fixed by the Council.

2. TYPES OF TIME SWITCHES.

Time switches controlling "Off Peak" storage water heaters on A.C. supply are of the synchronous motor driven type and are provided with suitable mechanism for switching supply "on" and "off" at prearranged hours.

ITEM NO.3 - TIME SWITCH SETTINGS.

3.1 Standard Hours.

Time switches controlling "Off Peak" hot water services are now set to connect, or cut in, supply at various times between 8.00 p.m. and 2.00 a.m. and to disconnect, or cut out, supply at various times between 5.00 a.m. and 8.00 a.m. each day. In general, Time Switches have been set for 6 hours or 9 hours, depending on element rating.

When visiting, for any purpose, premises at which a time switch is installed, Emergency Service Officers shall check the dial of the time switch and correct it if it is showing time error of one hour or more.

Officers dealing with jobs controlled by time switches shall check that all time switches that are fitted with "day" wheels are correctly adjusted for "day" as well as for "time" before leaving the job. To assist in this operation, these time switches bear a small label on the dial indicating the type of setting and the "Sunday" sector of the "day" wheel will be distinguished by a small dot of paint. A coloured disc bearing an arrow, in each day sector, controls the omission of the setting for each day. When the arrow points inwards the contacts operate and when the arrow points outwards the contacts will NOT close for the day indicated. It must be noted that the dial of an "SSS" type time switch must on no account be moved unless the time switch is mounted in a vertical position, otherwise the "day wheel" will not function when the time switch is put into service.

Should a Rate "A" time switch found with a setting other than six (6) or nine (9) hours or a setting, any part of which is outside the period 8.00 p.m. to 8.00 a.m. the details must be shown on the Daily Run Sheet for the information of the Meter Superintendent (M.S.).

3.2 Alteration of Setting.

Requests for alteration of setting should be resisted, but shall be agreed to where the customer is being deprived of hot water due to an unsuitable setting.

If the trouble is not due to defects, alter the setting, if a time switch is installed to a more suitable time within the limits set out in the schedule included in this item, or refer to M.S. for resetting of Zellweger relays.

3.3 Care to be Exercised

Officers should guard against a tendency to assume that an alteration of setting will solve a customer's problem. Experience has shown that Sangamo time switches which are commonly used to control Rate "A" storage water heaters are prone to develop intermittent faults which are not apparent by casual inspection.

3.4 Schedule of Time Switch Settings.

In order to relieve distribution centre and system peak loading, time switches controlling storage water heaters have been set to operate at the following times:

<u>Six Hours</u>	<u>Nine Hours</u>
12.00 midnight - 6.00 a.m.	8.00 p.m. - 5.00 a.m.
1.00 a.m. - 7.00 a.m.	9.00 p.m. - 6.00 a.m.
2.00 a.m. - 8.00 a.m.	10.00 p.m. - 7.00 a.m.
	11.00 p.m. - 8.00 a.m.

No time switch shall be set to cut in earlier than 8.00 p.m. or to cut out later than 8.00 a.m.

ITEM NO. 5 - CUTTING-IN OF TIME SWITCHES ON RATE "A" INSTALLATIONS WHICH INVOLVE CONSIDERABLE LOAD.

During the Winter peak load period when every effort is made to control the Council's peak demand, an Emergency Service Officer who, after making some check or adjustment; desires to cut-in the time switch of a Rate "A" installation at a large block of flats or similar installations where the one time switch and contactor control the supply to a number of tanks, should contact the System Operator before doing so if it is probable that the connected load of all or most of the hot water tanks will be in service during the peak periods.

If the System Operator is of the opinion that the cutting-in of the tanks will contribute to the recording of a high maximum demand, permission should not be granted.

In such circumstances, either the customers shall be told that the supply of hot water should be satisfactory the next morning or in the case of one tank only being affected combined with an urgent need of hot water, the fuses should be drawn on the remainder of the tank circuits and a later visit made by an Emergency Service Officer to replace them before the normal switching in time.

ITEM NO. 6 - TIME SWITCHES OTHER THAN SANGAMO CAUSING UNSATISFACTORY OPERATION OF STORAGE WATER HEATERS.

Where other than Sangamo Time Switches are installed and the following circumstances apply, Emergency Service Officers shall bridge the time switch:

- (a) Defective time switch mechanism or contacts.
- (b) Suspected defect in time switch.
- (c) Where it is suspected but cannot be ascertained that an intermittent defect exists in the time switch or heater circuit.

ITEM NO. 7 - TIME SWITCH STOPPED

When an Emergency Service Officer finds on arrival that a time switch is stopped for no apparent reason and he is able to start the time switch and leave it operating normally, the facts shall be entered on the Daily Run Sheet for the information of the Meter Branch. However, in the case of Sangamo time switches, the time switch shall be changed.

ITEM NO. 8 - REPORTING DEFECTS IN TIME SWITCHES.

- (a) Emergency Service Officers shall enter on their Run Sheets details of any defects found in time switches controlling Rate "A" storage water heaters and the action taken to ensure supply being left available to the heating elements.
- (b) When reporting on time switches the following particulars shall be given:
 - (i) Make of time switch.
 - (ii) Sydney County Council No.
 - (iii) Degree of inaccuracy, where adjustment of time has been necessary.
 - (iv) Time switch setting.

ITEM NO. 9 - METHOD OF BRIDGING TIME SWITCHES

The methods for bridging time switches shall be:-

- (i) Open the customer's switch controlling the water heater.
- (ii) Remove the line and load leads from the terminal block of the time switch, join them together by means of a connector and tape the connection.
- (iii) Reclose the customer's switch.

When a time switch is bridged for any purpose, a label shall be affixed to the bridged time switch showing:

Time Switches

- (i) Date
- (ii) Reason for bridging
- (iii) By whom bridged.

The Officer shall also clearly show details of the action taken on his Run Sheet and make use of the message cross procedure to ensure further action is taken.

ITEM NO.10 - SEALING

The Sydney County Council does not "earth" the metal cases of time switches and metering equipment, therefore, each time switch must be sealed separately.

In no case shall separate metal cases be connected together by means of wire and sealed with one seal.

The standard method of sealing Council's equipment is set out in Section No. 13, Item No. 39 of this Handbook.

ITEM NO.11 - DEFECTIVE SANGAMO TIME SWITCHES11.1 METHOD OF CHANGING AND RECORDING CHANGES OF TIME SWITCHES

Whenever a Sangamo Time Switch on an "off peak" storage water heating installation is found to be faulty or is suspected of being faulty after checking that the remainder of the storage water installation is in order, it shall be replaced by the Emergency Service Officer by one of the time switches carried in his vehicle.

Both the movement and the cover shall be replaced as they are correspondingly numbered and the Meter Branch history card shall be detached from the time switch taken from the vehicle and tied to the defective unit. Should it be necessary to replace the base also, any tags affixed to the old base shall be transferred to the new base.

The following entries shall be made on the time switch History Card:-

- (a) Customer's name and address.
- (b) Service Number and Pole Number.
- (c) Number of defective time switch.
- (d) Time switch setting as left.
- (e) Whether a master E.L.C.B. is installed ("Yes" or "No").

When all time switches in their vehicle have been used, officers shall restock from Emergency Service Depots at the first opportunity during shift arrangement with the Despatch Officer - a special visit to the Depot will not necessarily be made for the purpose. All defective time switches shall be returned to Depots at completion of shift - they shall not be carried over until the next shift.

When no vehicle spares are available to replace defective time switches, officers shall bridge the defective time switch in the manner set out in Item No.9 pending attention by the Meter Branch.

It should be noted that time switches must not be bridged by any other method than that set out in Item No.9 and that when a Time Switch is bridged out a label setting out the reason for bridging is to be attached to the Time Switch.

11.2 - Adjustment and Reporting of Time Switch Settings

Emergency Service Officers changing defective time switches shall:-

- (a) Adjust the setting of the new time switch to accord with the setting of the old one. If requested by the customer, the setting may be altered in accordance with the information contained in Item 3.1 of this Section.
- (b) Set the new time switch to correct time.
- (c) Enter on Service Reports the numbers of the old and new time switches and the setting as left, e.g.:

"T/S No. 4567 defective. Replaced by T/S No. 8910. Left set at 11/8". (If setting has been altered, include old setting).

- (d) When replacing S.S.A.O. time switch mechanism it is important that a three connection clock mechanism is not installed in a box wired for four connections as mechanism can become energised if earth terminal used for fourth connection is not sheathed. (Note) In every case time switch mechanism should be tested with test lamps before touching any metal parts as insulation could be faulty and time switch mechanism energised.

11.3 - Privately owned Time Switches

In Sutherland, Balmain and Bankstown areas, some customers originally purchased their own time switches for the control of their off peak hot water services. For purposes of identification these clocks are not stamped and numbered S.S.C., B.M.C. or S.C.C. but will have manufacturers' number only.

Emergency service officers who find these clocks in service and inoperative will bridge them out (even if S.S.A.O. type) and refer to Meter Section marking report:- Private time switch on Rate "A" defective.

The Meter Branch will visit the premises and instal a new time switch and return privately owned time switch to customer and obtain a receipt.

ITEM NO. 12 - TIME SWITCHES CONTROLLING SUPPLY ON RESTRICTED HOURS RATE

12.1. - Battery Charging

The type of synchronous time switch used to control supply on Restricted Hours Rate for the charging of batteries of electrically propelled vehicles shall be the type SP/SSS and the words "Restricted Hours - Battery" shall be shown on the window of the time switch. The time switch shall be set to switch in at 6.30 p.m. and out at 7.00 a.m. Mondays to Fridays inclusive, and to switch in at 6.30 p.m. on Friday and out at 7.00 a.m. Monday.

12.2 - Metal Melting Rate

Two-Rate Synchronous Control Relays used to control Metal Melting Rate supplies shall be set during the period 1st May to 31st August, inclusive, to cut in at the high rate at 9.00 a.m. and cut out at 5.45 p.m. and to cut in at the low rate at 5.45 p.m. and cut out at 9.00 a.m. Mondays to Fridays inclusive.

The relays shall be set to cut in at the low rate at 5.45 p.m. on Fridays and cut out at 9.00 a.m. on Mondays. This setting provides an unrestricted supply at the low rate during the week-ends.

During the period 1st September, to 30th April, the circuit shall be arranged so that the low rate meter only will operate during this period.

12.3 - Process Heating Rate

The time switch used to control Process Heating Rate supply shall be the type SP/SSS and shall have the words "Process Heating" shown on the window of the time switch.

The time switch shall be set to cut in at 10.00 p.m., cut out at 7.00 a.m., cut in at 12.00 noon, cut out at 1.00 p.m. on Mondays to Fridays inclusive, and cut in at 10.00 p.m. on Fridays and out at 7.00 a.m. Mondays.

This setting provides a supply at all times other than between the hours of 7.00 a.m. to 12 noon and 1.00 p.m. to 10.00 p.m. on Mondays to Fridays inclusive.

12.4 - General Purposes

The time switch used to control supply on Restricted Hours Rate for any other purpose shall be the type SP/SSS and shall have the words "Restricted

Hours" shown on the window of the time switch.

The time switch shall be set to cut in at 10.00 p.m. and out at 7.00 a.m. on Mondays to Fridays inclusive, and cut in at 10.00 p.m. on Fridays and out at 7.00 a.m. on Mondays. This setting provides a supply between 10.00 p.m. and 7.00 a.m. on week-days and on unrestricted supply during the week-end.

On a public holiday supply may be used outside the restricted hours provided that at least 48 hours notice is given to the Council on each occasion.

12.5 - Checking Time Switch Settings

Officers dealing with jobs controlled by time switches shall check that all time switches that are fitted with "day" wheels are correctly adjusted for "day" as well as for "time" before leaving the job. To assist in this operation, these time switches bear a small label on the dial indicating the type of setting as shown on page 13 and the "Sunday" sector of the "day" wheel will be distinguished by a small dot of paint. A coloured disc bearing an arrow, in each day sector, controls the omission of the setting for each day. When the arrow points inwards, the contacts operate and when the arrow points outwards, the contacts will NOT close for the day indicated. It must be noted that the dial of an "SSS" type time switch must on no account be moved unless the time switch is mounted in a vertical position, otherwise the "day wheel" will not function when the time switch is put into service.

Officers will note that clock mechanism resets day wheel $4\frac{1}{2}$ hours before cut in time, i.e. An officer resetting day wheel before 5.30 p.m. will set day wheel on day previous to that day on which he is attending, for example - If time switch was being set on Thursday day wheel would be set for Wednesday. See item 13/2.

ITEM NO. 13 - TIME SWITCHES CONTROLLING SUPPLY TO CONCRETE BLOCK ROOM HEATERS

13.1 - General

Concrete Block Room Heaters are manufactured in two sizes with an electrical rating of 1.5 kW and 1.1 kW respectively.

Provision of rate control equipment is necessary in order that such heaters can be controlled in accordance with the provisions of the restricted hours rate applicable to this type of load.

The heating period is 10.00 p.m. - 7.00 a.m. daily with the exception that the heaters are not energised on Friday or Saturday nights, or on both Friday and Saturday nights, depending on the customer's requirements.

A sangamo time switch fitted with an omitting device is used primarily for the rate control of such heaters.

The minimum loading of a group of heaters is 5.0 kW each. This exceeds the contact rating of the time switch and therefore necessitates the use of an Auxiliary Control Relay, type 3C or 4C.

13.2 - Time Switch Settings

- (a) The time switch tappets are set for 10.00 p.m. "on" and 7.00 a.m. "off".
- (b) The omitting devices are set to extend "OFF" switching for Friday night only, Saturday night only, or Friday and Saturday nights. (Extension of "OFF" switching prevents contacts which are already open from closing and thus they remain open for the night period for which they would have normally been closed). Red plugs with a slot and arrow head are provided for this purpose.

A dab of white paint is placed on the word "SUN" (denoting Sunday) marked on the omitting device dial. This is to facilitate setting the omitting dial to the correct day in the week, where the time switch is located in dark situations.

To set the omitting device for any particular day, it is only necessary to rotate the slotted pointer head from the inside position until it points to the letters representing the respective day.

- (c) The omitting device disc can be set to the correct day after turning dial to correct time, by rotating the disc in either direction, until the required day is opposite the fixed pointer (arrow) stamped on the plate and marked "day". It should be noted, however, that the day wheel change over in normal operation is effected by the "ON" tappet setting.

In the present case where the time switch is being used for switching Concrete Block Room Heaters and the "ON" tappet is set to switch on at 10.00 p.m., the actual day change over occurs at about 5.30 p.m. and in consequence the day indication on the day wheel is not correct until after 5.30 p.m., on any day.

Therefore, when setting time switches at any time of the day other than between 5.30 p.m. and midnight the day wheel should be rotated until the day previous to the day on which the time switch is being set is opposite the arrow. This means that if the time switch is being set on say Monday before 5.30 p.m., the day wheel should be set with "SUN" opposite the arrow. If the time switch is being set on Tuesday at the same time, the day wheel should be rotated until "MON" is opposite the arrow and so on. When the setting is being made between 5.30 p.m. and midnight, the day wheel should

be rotated until the actual day of the setting is shown opposite the arrow. As the change time is only approximately 5.30 p.m., care should always be taken to ensure the correct day setting.

(d) All time switches set as in 2 (a) and (b) page 10, are marked by means of a small typed label affixed to the time switch dial in the clear space between day and night, but so as not to obscure the dial time markings. The label markings are as follows:-

<u>Omitting Device Setting</u>	<u>Marking</u>
(a) <u>Friday and Saturday Night</u> (Omit "on" switching, or extend "off" switching).	O/FS
(b) <u>Saturday Night Only</u> (Omit "on" switching, or extend "off" switching).	O/S
(c) <u>Friday Night Only</u> (Omit "on" switching, or extend "off" switching).	O/F

13.3 - Defective Spring Reserve Time Switches Controlling Two-Rate Metering

Should an Emergency Service Officer find that the spring reserve time switch controlling two-rate metering is defective, the time switch should be left with the contacts in the open position so that the energy registration will be on the low rate.

Since the customers' account will be affected, it is important that the Foreman-Meter Inspector be notified as soon as practicable.

Cases reported to the Foreman-Meter Inspector by 11.30 a.m. on a general working day will be attended by Meter Inspectors on the same day.

13.4 - Replacement of Defective Time Switches

Stocks of one (1) of each type of time switch marked O/F.S., O/S and O/F are held in a special box in the Emergency Service Officers' City Depot and Crows Nest Depot.

During ordinary working hours, Emergency Service Officers shall bridge defective time switches controlling concrete Block Room Heaters and report defect to the Radio Telephonist as a U job, for urgent attention by the Meter Branch immediately on completion of the job.

Outside ordinary working hours, Emergency Service Officers shall, by arrangement with the Despatch Officer - Co-ordination, replace the defective time switch with one of the same type taken from the special box at City Depot or Crows Nest Depot.

The record card and the test card attached to the time switch shall be completed and the defective time switch shall be placed in the special box.

On no account must this type of time switch be bridged without immediate arrangements being made for replacement time switch, as concrete block heaters are not thermostatically controlled and rely on time switch control to prevent overheating.

13.3 - Concrete Block Heaters - Faults that may Occur

It is not anticipated that many electrical faults will occur with concrete block heaters themselves. The most probable fault would be H.R.C. terminal connections which should be readily adjustable by the emergency service officer attending.

In the event of a more serious fault occurring such as "O/C element" the block heater should be referred to the Electricity Sales Branch only in the case of Sydney County Council sale out of guarantee. Where the heater is a private sale or Sydney County Council sale and still in guarantee, the heater should be referred to the manufacturers.

When a heater, or heaters, is found not to be energised after the time switch has "cut in" it may be found that there is an external thermostat installed in the circuit controlling coil of contactor. This thermostat may be found fitted to an external wall of the building just outside a window on the same floor as the other controls.

In the event of such a thermostat being installed a check is to be made of the temperature setting. This may be found to be set at some setting less than 56°F and in such case must be altered to 56°F as the average minimum temperatures for Sydney during the months of June, July and August are 48.3°F, 46°F and 47.6°F respectively.

Further when checking the time switch of concrete block heaters in buildings where there are multiple connections of these heaters, during peak winter load conditions, the same precautions should be taken as similar to Rate "A" hot water service installations (Sect. 8 Item 5).

Under such circumstances, the main switch of the block heaters should be opened while the time switch is being checked.

Where the loading is such that it may interfere with the "peak demand" if the block heaters are "cut in", the emergency service officer should check with the System Operator and obtain his permission before switching this type of installation on during the peak periods.

When the permission of the System Operator is not granted, the customer is to be advised that it would be to no advantage to have the heaters turned "on" prior to the next heating period as there would be no benefit from the heaters until late in the evening. The emergency service officer is also to advise the customer that the block heaters would be operating normally the next morning.

13.4 - Replacement of Defective Time Switches

Stocks of two (2) of each type of time switch marked O/F.S., O/S and O/F are held in a special box in the Emergency Service Officers' City Depot.

During ordinary working hours, Emergency Service Officers shall bridge defective time switches controlling concrete Block Room Heaters and report defect to the Radio Telephonist as a U job, for urgent attention by the Meter Branch immediately on completion of the job.

Outside ordinary working hours, Emergency Service Officers shall, by arrangement with the Despatch Officer-Co-ordination, replace the defective time switch with one of the same type taken from the special box at City Depot.

The record card and the test card attached to the time switch shall be completed and the defective time switch shall be placed in the special box.

On no account must this type of time switch be bridged without immediate arrangements being made for replacement time switch, as concrete block heaters are not thermostatically controlled and rely on time switch control to prevent overheating.

ITEM NO. 14 - ADJUSTMENT OF TIME SWITCHES CONTROLLING STORAGE WATER
HEATERS

Type	ADJUSTMENTS FOR	
	CORRECT TIME SETTING	"ON" AND "OFF" SETTING
Sangamo Type KA	Correct time is set by turning the small knurled brass knob, which is fixed to a sprindle located on the right hand side and in line with the bottom of the time dial, in a clockwise direction until the correct time is indicated on the main dial. The black hand on the auxiliary dial shows the correct time in minutes.	<p><u>To set "On" Time:</u> Loosen the black bakelite knob on the main dial by turning in a clockwise direction, i.e. in the direction indicated by the arrow. Move the levers marked "ON" around the time dial until the arrow head appears opposite the required switching-in time. The arrow which is on the leading edge points to the required switching-in time. All "ON" levers to be placed together.</p> <p><u>To Set "OFF" Time:</u> With the bakelite knob still loosened, move the "OFF" levers around the dial until the arrow head stamped on them appears opposite the required switching-out time. All "OFF" levers to be placed together. TIGHTEN KNOB AT FINISH OF ADJUSTMENTS BY TURNING IN AN ANTI-CLOCKWISE DIRECTION</p>
Siemens Schuckert Type L3/LS43. Fitted with sliding time setting located on periphery of dial.	To set correct time, rotate dial in a clockwise direction until correct time appears under the tip of the stationery black time pointer.	<p><u>To Set "ON" Time:</u> Loosen knurled studs on block marked I and move this block around dial periphery, setting the V slot underneath Fig. 1 on the block at the required switching-in time. TIGHTEN KNURLED STUD AT FINISH OF ADJUSTMENT.</p> <p><u>To Set "OFF" Time:</u> Loosen knurled stud on block 2 and move this plug around the periphery of the dial, setting the V slot underneath Fig. 2 of this block at the required switching-out time. TIGHTEN KNURLED STUD AT FINISH OF ADJUSTMENTS.</p>
S.C.C. Type SSS.		

TYPE	ADJUSTMENTS FOR	
	CORRECT TIME SETTING	"ON" AND "OFF" SETTING
Siemens Schuckert Type L3/IS43. Supplied with screw-in type time setting plugs. S.C.C. Type SSS	To set time, rotate dial in a clockwise direction until the correct time appears under the tip of the stationary black time pointer.	To Set "ON" Time: Remove the knurled plug located on the outer circle of holes, and replace screw at the required switching-in time. Ensure that the plug is replaced in the outer circle of holes. To Set "OFF" Time: Remove the knurled plugs from the inner circle of holes, and screw in at the required switching-out time, ensuring that the plug is inserted in the inner circle of holes.
Venner Type MD2SL and other similar types. S.C.C. Type VS	Rotate dial in the direction indicated by the arrow, i.e. anti-clockwise, until correct time appears at tip of red pointer marked "TIME".	To Set "ON" Time: Unscrew the knurled knob on the main dial by turning in an anti-clockwise direction. Move the first "ON" lever until the arrow on the lagging edge indicates the required switching-in time. Set the second "ON" lever approximately three (3) hours behind the first "ON" lever. To Set "OFF" Time: While the knob is slack, move the first "OFF" lever until the arrow located on the lagging edge of the lever indicates the required switching-out time. Set the second "OFF" lever approximately three (3) hours behind the first "OFF" lever. TIGHTEN KNURLED KNOB AT FINISH OF ADJUSTMENTS BY MOVING IN CLOCKWISE DIRECTION.

Time Switches.

TYPE	ADJUSTMENTS FOR	
	CORRECT TIME SETTING	"ON" AND "OFF" SETTING
Newbridge Type V/SM. S.C.C. Type SN	To set correct time, rotate dial in direction indicated by arrow, i.e. clockwise, until correct time on dial is opposite trailing edge of red pointer located adjacent to top edge of time dial.	<p>Four (4) levers or tappets are provided - an "ON", "INTERMEDIATE ON", "OFF" and "INTERMEDIATE OFF".</p> <p><u>To Set "ON" Time:</u> Release the setting levers by lifting the small brass lever located at the centre of the time dial boss. Move the "ON" lever until the arrowhead located on the leading edge of the lever indicates the required switching time.</p> <p><u>To Set "OFF" Time:</u> While lever is released, move the "OFF" lever until the arrowhead located on the straight edge of the lever indicates the required switching-out time. Pair the "INTERMEDIATE ON" and "INTERMEDIATE OFF" levers, and leave set approximately three (3) hours behind the "OFF" lever. (These levers will be usually found paired, and will appear as one lever, the "OFF" marking covering the "ON" marking).</p> <p>RESET BRASS LEVER BY PUSHING BACK ON TO DIAL BOSS AND DIAL PLATE ON COMPLETION OF ADJUSTMENTS.</p>

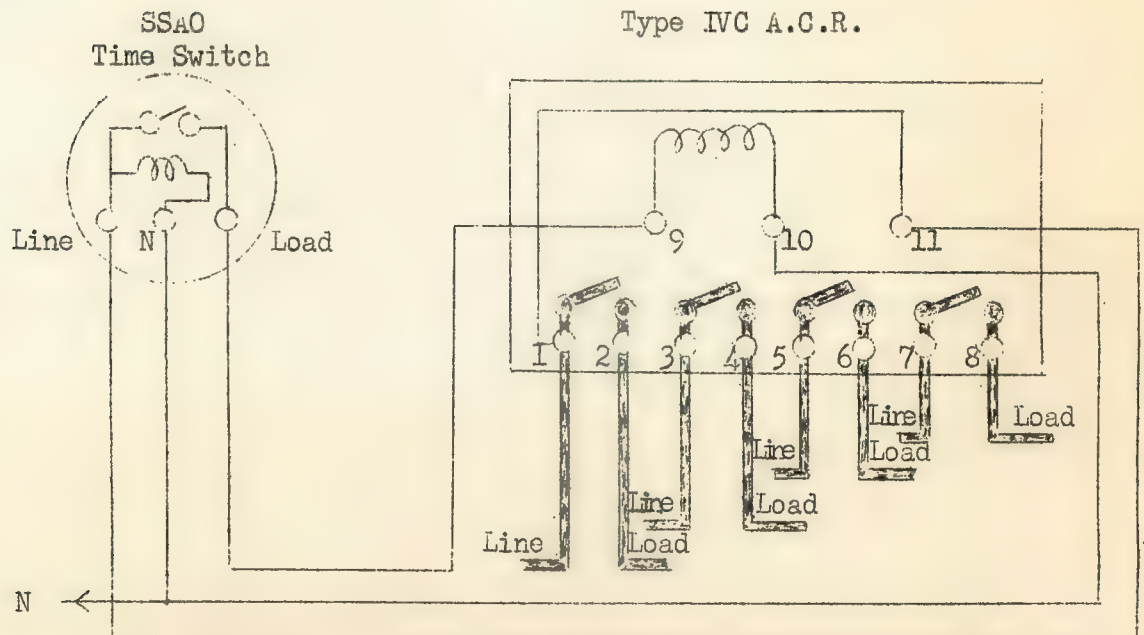
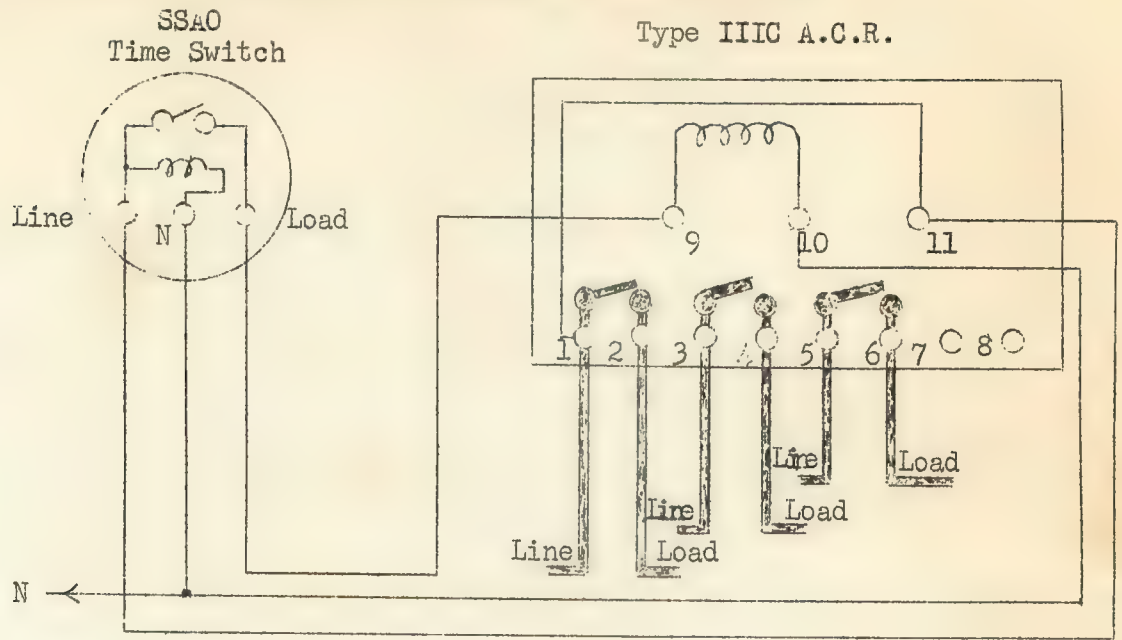
TYPE	ADJUSTMENTS FOR	
	CORRECT TIME SETTING	"ON" AND "OFF" SETTING
<p>Newbridge Type V/SM, fitted with lever marked "DELAY OFF".</p> <p>S.C.C. Type SM</p>	<p>To set correct time, move dial in clockwise direction until correct time appears on red pointer located adjacent to top edge of dial.</p>	<p>Five (5) levers are provided, marked "ON", "INTERMEDIATE ON", "OFF", "INTERMEDIATE OFF", and "DELAY OFF".</p> <p><u>To Set Switching-in Time:</u> Release the setting levers by lifting the small brass lever located at the centre of the time dial boss. (Note: One of the "OFF" levers is fixed to the back of the dialplate, and the time dial face is free to rotate). While the lever is released, move the time dial face backwards or forward until the required switching-out time appears opposite the straight edge of the fixed "OFF" lever. Place the lever marked "DELAY OFF" to cover the fixed "OFF" lever. Pair the "INTERMEDIATE ON" and "INTERMEDIATE OFF" levers (these will usually be found paired, and appear as one lever, the "OFF" marking covering the "ON" marking), and leave set approximately three (3) hours behind the fixed "OFF" lever. Move the "ON" lever until the arrowhead (trailing edge) indicates the required switching-in time.</p> <p>RESET BRASS LEVER BY PUSHING BACK ON TO DIAL BOSS AND DIAL PLATE AFTER COMPLETING ADJUSTMENTS.</p>

Time Switches.

TYPE	ADJUSTMENTS FOR	
	CORRECT TIME SETTING	"ON" AND "OFF" SETTING
Sangamo S.S.A., S.A.O. S.C.C. Type SSAO	To set correct time, move dial in direction indicated by arrow, i.e. anti-clockwise, until correct time appears under red pointer marked "TIME".	<p><u>To Set "ON" Time:</u> Loosen bakelite dial knob by turning in clockwise direction. Move first "ON" lever (in the direction of the arrow) around time dial periphery until the index marked on the lever surface appears opposite the required switching-in time. Set the second "ON" lever approximately three hours behind the first "ON" lever.</p> <p><u>To Set "OFF" Time:</u> While bakelite knob is free, move first "OFF" lever (in the direction of arrow) around time dial periphery until the index mark on the lever surface appears opposite the required switching-out time. Set the second "OFF" lever approximately three hours behind the first "OFF" lever. TIGHTEN BAKELITE KNOB BY TURNING IN AN ANTI-CLOCKWISE DIRECTION.</p>

APPENDIX A.

DIAGRAMS OF CONNECTIONS - AUXILIARY CONTROL RELAYS.



ITEM NO.15 - TERMINAL CONNECTIONS FOR TIME SWITCHES CONTROLLING RATE "A" WATER HEATING INSTALLATIONS.

The terminal connections are taken facing the front of the time switch.

TYPE OF TIME SWITCH.TERMINAL CONNECTIONS .

SN Newbridge	Left terminal	- Line active.
	Top right terminal	- Load.
	Bottom right terminal	- Neutral.
SSAO Sangamo	Left terminal	- Line active.
	Centre terminal	- Neutral.
	Right terminal	- Load.
VS Venner	Left terminal	- Load.
	Centre terminal	- Neutral.
	Right terminal	- Line active.
SS Siemens Schuckert	First terminal on left	- Not used.
	Second terminal	- Line Active.
	Third terminal	- Load.
	Fourth terminal	- Neutral.
SSS Siemens Schuckert used with contactor	First terminal on left	- Opens contactor.
	Second terminal	- Line active.
	Third terminal	- Closes contactor.
	Fourth terminal	- Neutral.
SKA Sangamo 2 phase, 415 volt	First upper stud on left-	Not in use.
	Second stud on extreme upper right	- Neutral.
	First terminal on left	- Phase 1 Line active.
	Second terminal	- Phase 2 Line active.
	Third terminal	- Phase 2 Load.
	Fourth terminal	- Phase 1 Load.
AEG (Only 8 in service)	Left terminal	- Line active.
	Centre terminal	- Load.
	Right terminal	- Neutral.

Time Switches.ITEM NO.16 - CONNECTION AND SETTING OF A.E.G. SYNCHRONOUS TIME SWITCHES FOR "OFF PEAK" SUPPLY.Description.

The A.E.G. time switch has a self starting synchronous motor enclosed in a pressed sheet metal case with an aluminium cover. Incorporated in the cover is a circular removable subsidiary inspection cover, having attachments for locking and sealing it thereto. In this subsidiary cover is an inspection window immediately in front of the time switch dial.

The contact points of the time switch consist of one stationary and one movable.

The movable contact point is operated by a seven (7) tooth wheel of irregular shape having six wide teeth or lever lifting points, causing each of the six (6) teeth to lift the movable contact point to two distinct positions in each day, but the seventh (7th) or delay off tooth is of much smaller dimensions than the rest and when in operation it lifts the movable contact point to one position only, thereby enabling the "Delay Off" Switch to operate at any pre-determined time required, in this case 6.00 a.m. Sunday.

This seventh (7th) tooth wheel is operated by means of a lever ratchet and pawl method, the movement of the lever being caused by a tripping pin affixed to the time dial.

There are three (3) of these tripping pins attached to the time dial.

Connections.

The connection of the A.E.G. time switch is similar to the Siemens Schuckert type, there being three (3) terminals. Commencing from the left Nos. 1, 2, 3 being respectively Line, Load and Neutral.

Setting of Time Switch.

For a setting of 9.00 p.m. - 6.00 a.m.:-

- (1) The time dial must always be turned in a clockwise direction.
- (2) Set the time dial to 12 noon.
- (3) Set one of the three (3) tripping pins to 9.00 p.m. (21 on Dial).
- (4) Set the second tripping pin to 6.00 a.m.
- (5) Set the third tripping pin to "Delay Off " 6.00 a.m.

Having made certain that the tripping pins have been set correctly, turn the dial a complete cycle of operations (i.e. seven (7) days) to ensure that the mechanism operates in the correct sequence.

ITEM NO.17 - CONNECTION AND SETTING OF SANGAMO TYPE "K.A." TIME SWITCHES.Description.

The above time switches are available in two sizes:-

Sangamo Type K.A., Single Pole, 35 Amp. 240 Volt, and
Sangamo Type K.A., Double Pole, 35 Amp. 415 Volt

and are designated SP/KA, 35/240 and DP/KA, 35/415 respectively.

These Time Switches are intended to control a supply of electricity at customers' premises during restricted hours for load in excess of 15 amperes. The Time Switch is enclosed in a pressed metal case, the door of which has a suitable latch for sealing purposes. The case contains three "Knock out Blanks" to allow the connection of the conductors to the terminals.

A diagram of terminal connections is provided on the inside of the time switch cover.

The time switch is operated by a synchronous 240 volt motor energised from the first cable lug on the left (active) and the extreme right hand terminal screw (neutral).

The motor can be viewed through the window above the first cable lug.

Connections.

In the single pole time switch there are two cable lugs provided, the first on left being "Line" and the second one "Load". The extreme right hand terminal screw is the neutral connection.

In the double pole time switch there are four cable lugs provided, Nos.1 and 2 (left hand) being the "Line" terminals and Nos.3 and 4 the "Load". The extreme right hand terminal screw is the neutral connection as in the single pole.

Setting of Time Switch.

The switch can be set for one, two or three "On" and "Off" operations, each 24 hours.

For a single "On" and "Off" operation in 24 hours, the three levers are stacked together. For two or three operations, the levers are separated with alternate "On" and "Off" positions. The time at which an operation occurs is indicated by the position of the radial (Leading) edge of the levers.

To set the "Hour" dial, turn the small protruding knurled knob (adjacent to the minute hand) in a clockwise direction, until the time pointer at left of the minute hand indicates approximate time, then observe small minute hand for final adjustment.

Time Switches.

Note: The "Hour" dial should always be turned in this manner.

Change of Setting Times.

To change the lever setting times, loosen black thumb nut on the "Hour" dial as indicated by turning to the right, set levers to desired position and tighten thumb nut by turning to left.

Manual Operation.

To close switch, move lever marked "On" in the direction indicated by Arrow.

To open switch move lever adjacent to the time pointer and marked "Off" in direction indicated by arrow.

ITEM NO. 18 - CONNECTION AND SETTING OF TYPE SS.A0 AND SSA4 SYNCHRONOUS TIME SWITCHESDescription.

The Sangamo type SS.A0 synchronous motor operated time switch is of the plug-in type with a self-starting synchronous motor enclosed in a cylindrical case of synthetic moulded material. It is of the single pole type, rated at 15 amperes, 240 volts, and is used for Rate A water heating installations.

The time dial is divided into day and night periods setting out each hour of the day with subdivisions of fifteen minutes and rotates in an anti-clockwise direction. The time dial is equipped with four tappets which provide for, if required, two cut-in and cut-out operations daily.

The time pointer is located at the left of the time dial and opposite the time pointer an aperture is provided to observe that the motor is running. Immediately below the time pointer is an inspection window for the observation of the switch contact points.

A red push button is provided in the case to enable the manual operation of the switch without removing the cover.

The motor circuit is fused on both poles and two spare fuses are incorporated in the switch.

Three metal inserts at the lower end of the base provide the terminal connections which, from left to right, are line, neutral and load.

A diagram of the connections is moulded in the base of the time switch.

An earthing terminal is provided, but this will not be used at present. No cover screws are required for fixing the cover which is provided with two spigots which fit into metal grooves on the base.

On S.S.A.4 time switches the earth terminal in the box is used for a fourth terminal to energise the time switch motor, the clock mechanism is altered to utilise this contact, the neutral being connected direct, thus time switch is connected without fuses in the motor circuit.

When S.S.A.4 mechanism is used in a S.S.A.O. base the motor lead must be removed from fourth terminal and replaced in fuse socket with a fuse inserted in motor circuit. Important note: If an S.S.A.O. mechanism is plugged into an S.S.A.O. base which has been connected with a fourth terminal wire in the earth connection, the clock mechanism can become energised. Officers must exercise care to recognise this potential hazard.

Setting of Tappets

- (1) Loosen tappets by holding the time dial and turning the bakelite knob in a clockwise direction as indicated by the arrow on the knob.

Time Switches

- (2) Place one of the two tappets which are marked "Off", at required switching-off time and the other at 12 noon, then place one of the two tappets marked "On" at required switching-on time and the other at 12 midnight. See that the line marked on each tappet coincides with the hours as stated.
- (3) Lock the tappets in position by turning the bakelite knob in an anti-clockwise direction till the tappets are secure.

Installation of Time Switch

- (1) Remove cover by turning to the left.
- (2) Remove mechanism from case by holding bakelite knob and pulling straight out. Do not remove mechanism by pulling on the time dial.
- (3) Secure time switch base to meter board by the screws provided. The screws should be tightened only to a reasonable degree to avoid a fracture of the case.
- (4) Connect external wiring in accordance with the diagram moulded on the base. The connections from left to right are line, neutral and load. It should be noted that the connections of the external wiring to this type of time switch differ from the existing types in which the neutral is at the extreme right-hand side.
- (5) Insert mechanism by means of the bakelite knob.
- (6) Set time switch to the correct time by turning the time dial anti-clockwise until correct time is indicated by the time pointer. The time switches are issued with the tappets set to the correct operating times and it should not be necessary to alter the settings.

Sealing.

Pass the sealing wire twice through the sealing lug on the case before replacing the cover. Replace cover by turning in a clockwise direction until both sealing lugs meet and pass one end of the sealing wire through the sealing lug on the cover. Twist both ends of sealing wire together and attach seal in the usual way.

The push button for external manual operation of the switch is sealed by passing sealing wire through the hole provided and sealing in the usual manner.

ITEM NO.19 - CONNECTION AND SETTING OF "NEWBRIDGE" TYPE SN TIME SWITCHES.Description.Type.

The Horstmann Gear Co. Ltd. "Newbridge" type SN synchronous motor operated time switch is of the "plug in" type with a self starting synchronous motor mounted inside an aluminium case, the door of which is secured by a two lever locking and clamping device operated by the outside lever. A window is provided in the door of the case for observation of time settings.

Time Dial.

The time dial rotates in a clockwise direction and is divided into night and day periods with divisions for each hour of the night and day from 6.00 p.m. to 6.00 a.m. and 6.00 a.m. to 6.00 p.m. respectively, and each hour has subdivisions of 15 minutes.

Time Pointer.

A pointer to indicate the time is located adjacent to the edge of the time dial at the top centre of the dial.

Connections.

A terminal block is located inside the case and the connections from left to right are -

Line and load, while the lower right hand terminal is the neutral connection for the motor.

Operation.

The contact points of the switch are operated by a cam which, in turn, is operated by a lever.

This lever is situated behind the dial and protrudes through a slit in the clock movement case, and when operating, travels from one side of the slit to the other.

The position of the lever when on the extreme right hand side of the slit indicates "switch closed" and when on the left hand side "Switch open".

The time switch is so constructed that there should be no necessity to remove the dial from its spindle, except in time switches fitted with a "delay off" tappet where it becomes necessary to alter the "delay off" to other than a Sunday. Unnecessary removal of the dial or time switch from its case must be avoided.

Time Switches.

Setting of Tappets.

a. Time Switches not fitted with "Delay Off" Tappet.

(1) Four (4) tappets are provided, an "ON", intermediate "ON", "OFF" and intermediate "OFF".

(11) Rotate dial in a clockwise direction until correct time on dial is opposite the trailing edge of the time pointer.

(111) Release dial clamp (a small brass lever located in centre of dial boss).

(1V) Move "ON" tappet until arrowhead (located on trailing edge of tappet) indicates operating time.

(V) Move intermediate "ON" tappet over the intermediate "OFF" tappet, which renders these tappets inoperative. (This operation gives an idle movement to these tappets).

(VI) Move "OFF" tappet until arrowhead (located on trailing edge of tappet) indicates operating time.

(VII) Move intermediate "ON" and "OFF" tappets to a position one hour behind the operating time of the "OFF" tappet.

(VII1) Having set all four tappets correctly, press down the dial clamp and turn the dial through a complete cycle of operations (i.e. seven (7) days) to ensure that the mechanism operated in the correct sequence.

b. Time Switches Fitted with "Delay Off" Tappet.

A small number of "Newbridge" time switches have been supplied with a "delay off" tappet.

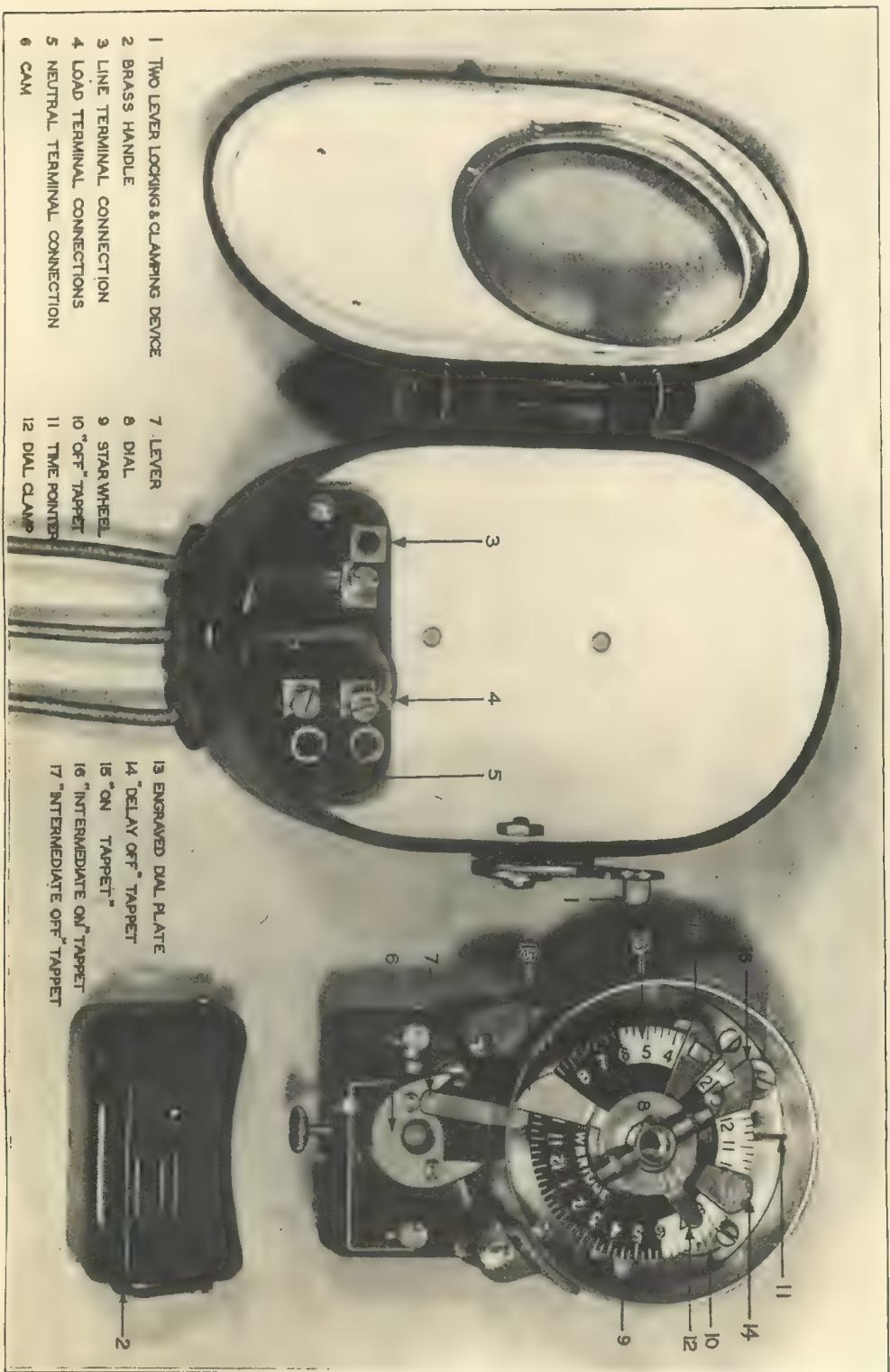
The limit of the "delay off" is $8\frac{1}{2}$ hours later than the normal operating "Off" time.

(1) The dial must always be turned in a clockwise direction.

(11) Turn the entire dial until the time pointer has just turned the "STAR" wheel and the "STAR" wheel has passed the time pointer. Turn the "STAR" wheel only, by hand, to a day other than that on which the delay off is required.

(111) Turn the entire dial a little further until the "OFF" tappet behind the dial has commenced to lift the time pointer.

NEWBRIDGE SYNCHRONOUS TIME SWITCH



- (iv) Lift the dial clamp and turn the engraved dial plate only (not the entire dial) until the normal off time is in line with the left hand edge of the abovementioned "OFF" tappet (the one behind the dial).
- (v) Set the "DELAY OFF" tappet until its left hand edge is at the "DELAYED OFF TIME" required.
- (vi) Set the "ON" tappet to the required time of operation.
- (vii) The intermediate "ON" and "OFF" tappets, when not required to operate, are readily rendered inoperative by slipping the "ON" tappet over the "OFF" tappet when an idle movement is obtained.
- (viii) Having set all five tappets correctly, press down the dial clamp and turn the dial through a complete cycle of operations (i.e. seven days) to ensure that the mechanism operates in the correct sequence.
- (ix) It should be noted that the correct day of the week is shown about $2\frac{1}{2}$ hours before the normal off time.
- (x) Finally, before leaving the time switch ready for service, check the setting of the dial for the correct time, the star wheel to the correct day.
- (xi) The dial is so adjusted when despatched, that the late or "DELAY OFF" tappet operates only on Sundays. This day may be varied by removing or inserting pins in the appropriate day or days in the "STAR WHEEL".

To enable this to be done, the dial must first be removed, and this is accomplished by raising the dial clamp and pulling the dial plate off its spindle, upon which it is frictionally mounted.

Time Switches.ITEM NO.20 - CONNECTION AND SETTING OF VENNER TYPE VS TIME SWITCH.Description.Type

The Venner type VS synchronous motor-operated time switch is of the plug-in type with a self-starting synchronous motor enclosed in an aluminium case. It is of the single pole type rated at 15 amperes, 240 volts, and is used generally for Rate "A" water heating installations.

Time Dial.

The time dial rotates in an anti-clockwise direction and is divided into "a.m." and "p.m." periods, and also into "Day" and "Night" periods. The "Night" period, indicated by a shaded area, is from 6.00 p.m. to 6.00 a.m. Each hour of the day with sub-divisions of 15 minutes is also indicated on the dial.

The dial is equipped with four tappets which provide for, if required, two switching-in and two switching-out operations daily.

Time Indicator.

A red pointer to indicate the time, marked "Time", is located just below the centre of the dial.

Inspection Apertures.

Two inspection apertures are provided, one to observe that the motor is running, and the other for the observation of the switch contact points.

The inspection aperture to observe that the motor is running is located on the housing for the motor and gears, on the right-hand side of the dial.

The aperture for observing the switch contact points is located on the bottom left-hand corner of the time switch. It is necessary to open the door of the case for this inspection.

Connections.

A terminal block is located inside the case, and the connections from left to right are - Load, Neutral and Line.

A diagram of the connections is moulded in the terminal block and a white mark indicates the load terminal. An earthing terminal is provided but this will not be used at present.

A fuse is installed in the synchronous motor circuit and is located on the under side of the switch base, adjacent to the line terminal plug. To replace fuse, slacken off screw, swing clip clear and eject fuse. After replacement, see that the screw is secure.

Setting of Tappets.

Loosen tappets by holding the time dial and turning the knurled nut in an anti-clockwise direction.

Place one of the two tappets which are marked "Off" at required switching-off time and the other at 12 noon, then place one of the two tappets marked "On" at required switching-on time and the other at 2.00am.

Lock the tappets in position by turning the knurled nut in a clockwise direction - finger-tight is sufficient.

As the clearance between the tappets and the time pointer is very small, care must be taken to ensure that the dial is correctly seated on the clock spindle shaft before tightening down. Operate dial one complete revolution to check that the tappets do not foul the time pointer.

Manual Operation.

A red push-button marked "Test" which enables manual switching on and off is provided. It is necessary to open the door of the case to operate this push-button.

ITEM NO.21 - CONNECTION AND SETTING OF SIEMENS-SCHUCKERT A.C. TIME SWITCHES FOR "OFF PEAK" SUPPLY.

Description.

The Siemens-Schuckert time switch has a self-starting synchronous motor, enclosed in a pressed sheet metal case. Incorporated in the cover of this switch is a hinged circular subsidiary inspection cover having attachment for sealing purposes, also a window immediately in front of the time switch dial for observation of time settings.

Connections.

There are four terminals in the terminal block. The extreme left hand terminal is either bridged internally to the terminal next to it, or completely disconnected so that only Nos, 2, 3 and 4 terminals are used when connecting the switch; these are line, load and neutral respectively.

Setting of Time Switch.

The time dial of the switch is marked from 1 to 24 with half hour subdivisions. No.1 on the dial equals 1 a.m., No.2 equals 2 a.m. and so on to 12 which is midday; 13 equals 1 p.m., 14 equals 2 p.m. and so on to 23 which is 11 p.m., and 24 being shown on the dial T1) which is midnight.
T2)

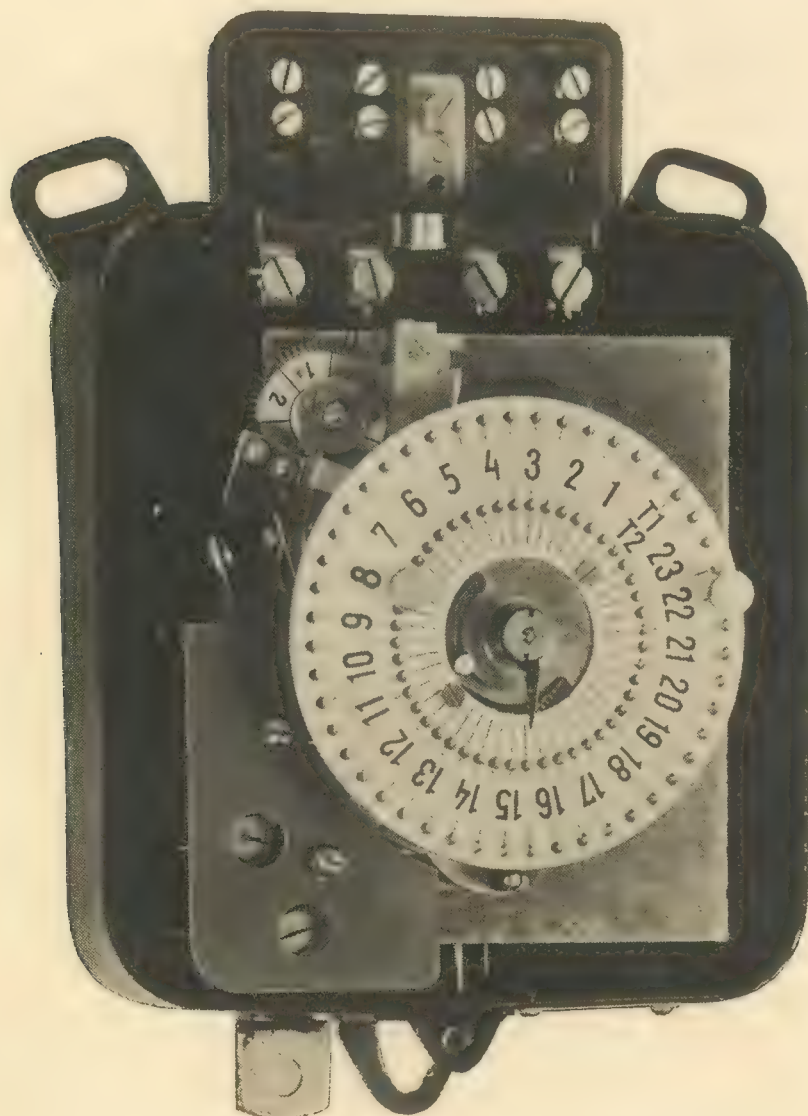
Two knurled screw setting pins set in the time dial determine the times of operation of the switch. There are two rings of holes in which these pins may be inserted. The position of the pin in the outside ring of holes sets the time when the switch will cut in. The position of the pin in the inside ring of holes sets the time when the time switch will cut out. These switches are required to limit the supply between 9.00 p.m. and 6.00 a.m. daily and are set to these times when issued.

In a later model of this switch the two rings of holes have been superseded by a grooved ring, and riding clips are provided in lieu of the setting pins; this allows the subdivision of the time dial to be graduated every 15 minutes in lieu of 30 minutes.

The time pointer rises vertically from the centre spindle of the dial. This pointer remains stationary, and as the dial rotates beneath the pointer, the pointer indicates the time on the dial.

Near the centre of the timing dial, working in a crescent shaped slot is a lever, which when set at any time between 6 a.m. and 6 p.m. delays the opening of the switch until a later time on Sundays only. Except in special cases which are clearly indicated on labels attached to the time switches, this lever is not now set to delay the opening of the time switch after 6.00 a.m. on Sundays. At the bottom right hand side of, and behind, the time dial is located a wheel called the day wheel, marked with seven (7) numbered divisions, the seventh division being coloured red.

SIEMENS SCHUCKERT SYNCHRONOUS TIME SWITCH



Time Switches.

On the plate carrying the day wheel is a red line. The numeral on the day wheel that is opposite this line indicates the day of the week, taking Monday as No.1.

Procedure for Setting Time Switch to Correct Time.

To set the clock of the time switch correctly, the timing dial must be rotated in a clockwise direction until the numeral corresponding to the day of the week on the day wheel is opposite the red line on the plate carrying the day wheel. The timing dial can then be set to the correct time of the day by co-relating the time pointer with the time graduations on the dial.

To place the day wheel into synchronism with the timing wheel, proceed as follows:-

1. Set time dial to 15th hour of day, i.e. 3 p.m.
2. Rotate star shaped wheel in an anti-clockwise direction until the numeral six (6) is just past the red line.
3. Set timing dial to correct time until the day wheel shows the correct day, they will then be in synchronism.

When the Rate "A" for "OFF PEAK" supply was first adopted by The Sydney County Council it provided for a later cut-out on Sundays, viz. 11 a.m., in lieu of 6.00 a.m., but since then the extension of a later cut-out on Sundays has been abandoned, and as previously stated, all time switches issued for this particular rate are issued, set to provide supply up to 9 hours between the hours of 8.00 p.m. and 8.00 a.m. daily.

The timing dial must never be rotated in an anti-clockwise direction.

Adjustments must be made only when the time switch is in a fixed or vertical position.

Time Switches.ITEM NO.22 - TIME SWITCHES USED WITH 3-PHASE CONTACTORS FOR RATE "A" WATER HEATING SUPPLIES.

Where the rating of a water heater warrants it, or where a number of water heaters are installed at the same premises, a 3-phase latching type contactor and a contactor time switch are used to control the supply.

The type of time switch used to operate the contactor is the Siemens Schuckert type SP/SSS and is known as the contactor type.

The word "Contactor" is shown in the glass window of the time switch.

Description of Time Switch.

The contactor time switch is similar to the type SP/SSS time switch which is described in Item No.21, except that it is provided with an additional switch contact and the terminal connections are modified to accommodate another wire.

All four terminals in the terminal block are used, whereas in the ordinary time switch only three are used. The second or No.2 terminal from the left, as in the ordinary time switch, is the incoming ac connection, and likewise the extreme right-hand or No.4 terminal is the neutral connection.

The synchronous motor coil is connected to these two terminals.

The No.1 terminal which, in the ordinary time switch, is unused, provides the connection to the No.1 terminal of the 3-phase contactor, and the No.3 terminal provides the connection to the No.3 terminal of the contactor.

There is no bridge between the No.1 and No.2 terminals of the time switch as in the case of the ordinary time switch.

Two contacts are provided in the time switch in the neutral circuit, of which one is connected through No.1 terminal to the opening solenoid of the contactor, and the other is connected through No.3 terminal to the closing coil of the contactor.

The opening or closing of the time switch contacts depends upon the operation of the "on" and "off" tappets.

The active wire connection to the time switch is used only for the supply to the synchronous motor.

Description of Contactor.

The 3-phase contactors are supplied in four sizes, the maximum current ratings being 40, 50, 100 and 200 amperes respectively. The contactor has three main incoming supply terminals and three outgoing terminals which are connected to the load circuit. The main switch contacts are operated by an opening and a closing solenoid.

Three auxiliary terminals are provided for operating the solenoids of the contactor. Nos.1 and 3 of these terminals are connected to the time switch, the No.2 terminal is connected to the same active supply as that controlling the motor of the time switch.

In the case where an earth leakage breaker is connected this active wire is connected to the line side of the earth leakage breaker.

The contactor is provided with two auxiliary switches which are operated by the solenoid latching mechanisms. The auxiliary switches are provided to interrupt supply to the solenoids after operation so that both coil circuits are not energised, except during the period of operation.

When the time switch operates to close the contactor it completes the circuit of the closing coil through the auxiliary switch of the opening solenoid and operates the closing coil. In its operation the closing coil closes the auxiliary switch contacts connected in series with the opening coil circuit and opens the auxiliary contacts attached to the opening solenoid. When the time switch operates to open the contact it completes a circuit through the opening solenoid which, in operating, opens the auxiliary switch on the closing coil and closes its own auxiliary switch.

A diagram of connections of a 3-phase contactor is attached.

The early type contactors purchased were provided with only one auxiliary switch but these are being altered from time to time to make them standard. The only difference in the external wiring connections between the early type and the later type is that no wiring is connected to the No.2 terminal of the contactor.

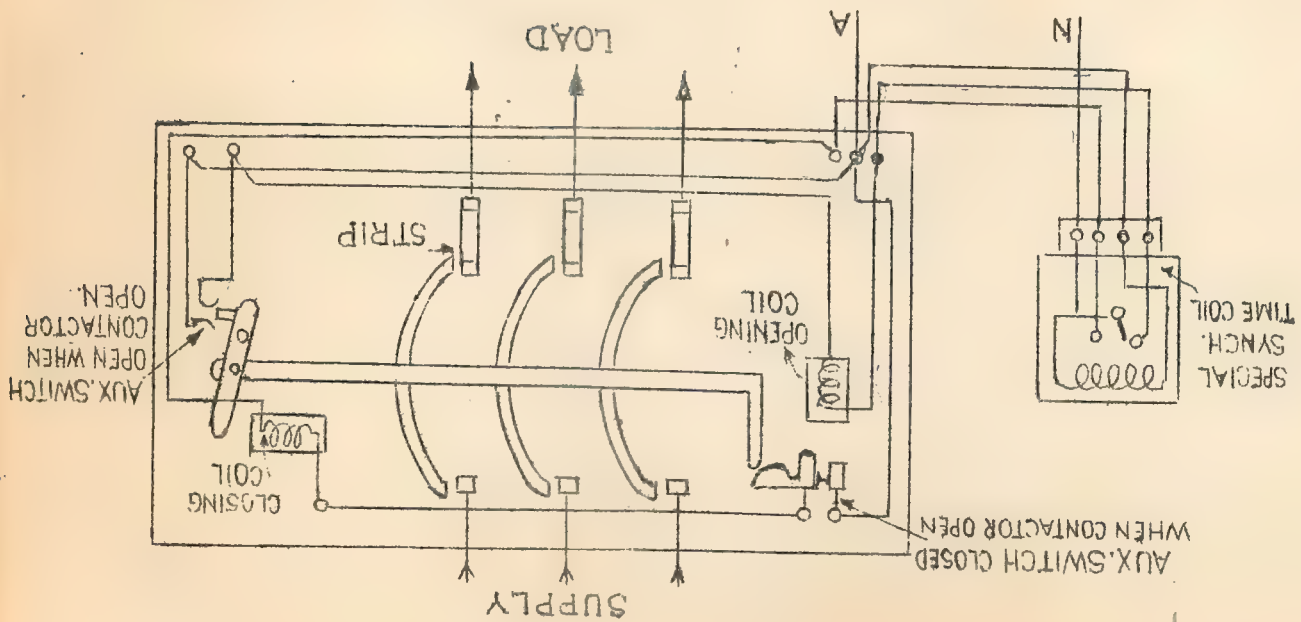
Checking of Contactor.

When checking operation of contactor operate by rotating the dial of the time switch to open and close the contactor.

Check that all auxiliary contacts and the main switch contacts are in order.

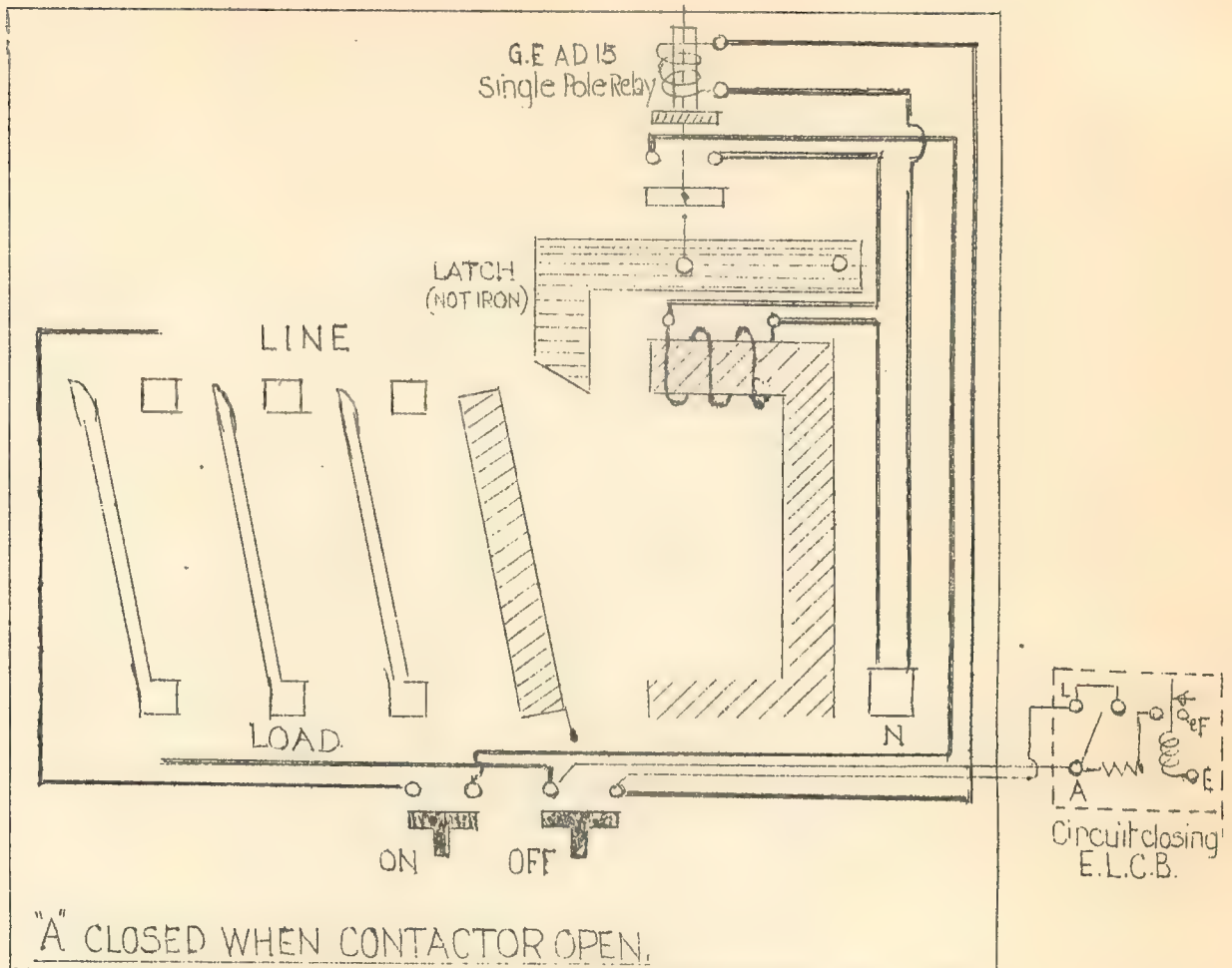
If it is necessary to carry out any adjustment to the contactor, it must be de-energised and a check taken with test lamps to prove that it is not energised.

3 PHASE 50 & 100 AMP. S.C.C. LATCH-IN GODFREY CONTACTORS



WIRING OF TIME SWITCHES.

CONTACTOR COILS ETC. ON LINE SIDE OF METERS



OPERATION

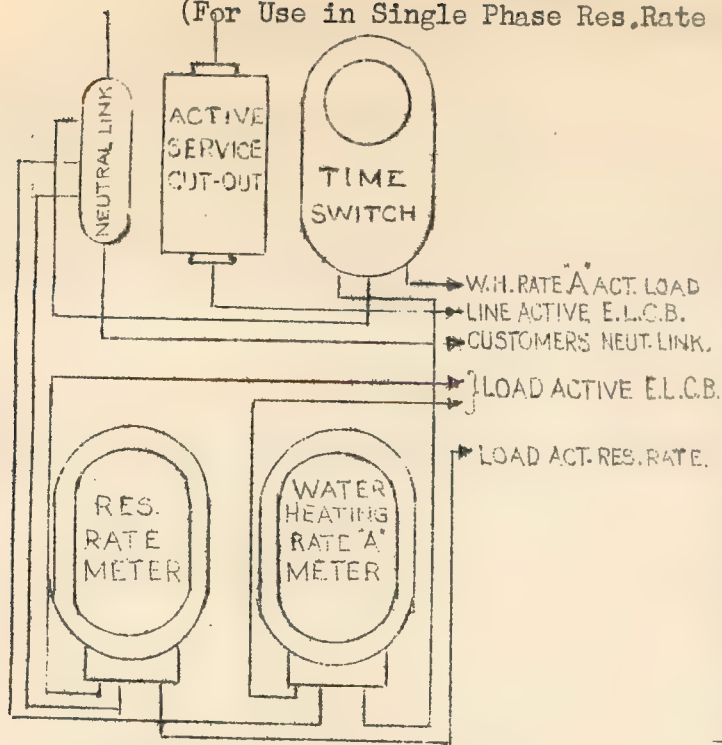
CLOSE: Push ON Button: current picked up from contact through "ON" button, through "A", through main coil to neutral. (or other phase). The main contactor closes, latch drops which opens "A" and thus opens main coil circuit, however contacts are maintained in "ON" position by latch pressing against back of main armature.

OPEN: Push "OFF" button: current picked up from LOAD side of main contacts, through OFF button, through relay coil which lifts latch and allows main contacts to open. This opens the circuit to Relay coil.

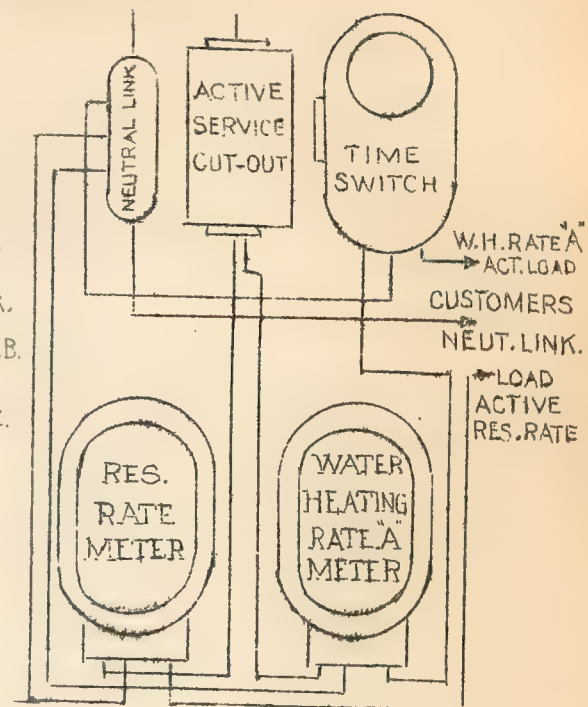
WIRING OF TIME SWITCHES.

CONCENTRATED SERVICE BOARD.

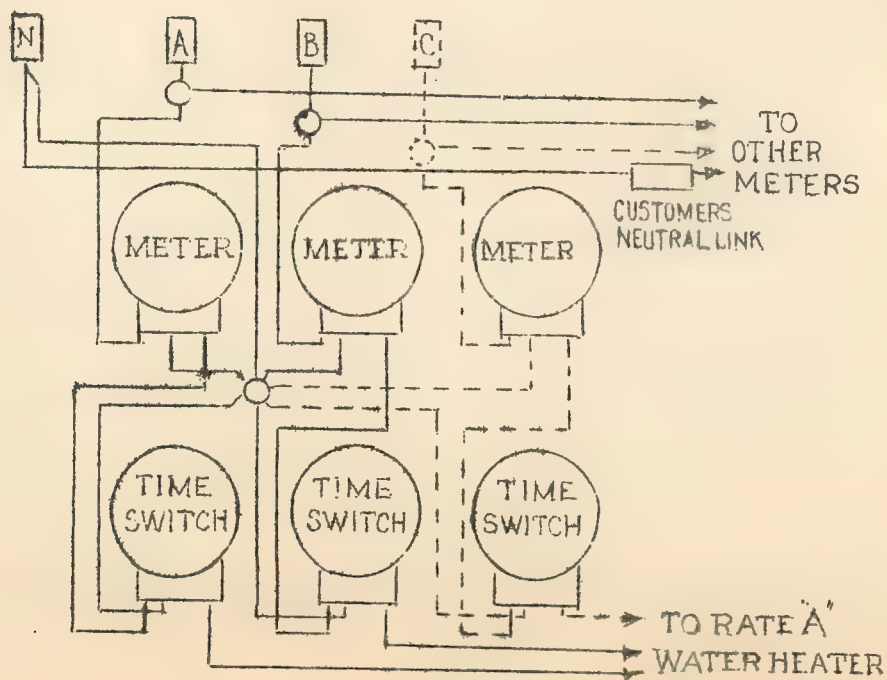
(For Use in Single Phase Res. Rate installations).



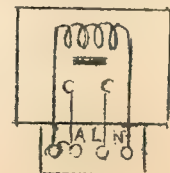
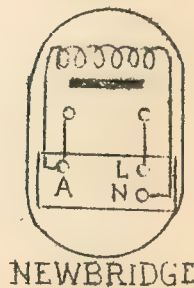
INSTRUMENT CONNECTIONS
FOR
INSTALLATIONS CONTROLLED BY MASTER E.L.C.B.



INSTRUMENT CONNECTIONS
FOR
INSTALLATIONS NOT CONTROLLED
BY MASTER E.L.C.B.



2 OR 3 PHASE UP TO 15 AMPS PER PHASE



DETAILS OF TIME
SWITCH TERMINAL BLOCKS



TIME SWITCHESSection No. 8ITEM NO. 23 - THE LANDIS AND GYR K.Y.B.I. DUAL DIAL TIME SWITCH
FOR OFF PEAK OR EXTENDED OFF PEAK WATER HEATERS AND SPACE HEATERSDescription

The Landis and Gyr K.Y.B.I. time switch is mounted in a black bakelite case approximately 8" x 5" with a clear plastic cover which gives a view of the dual dials and switch mechanism. The time switch is a two circuit 2 phase type rated at 30 amperes per circuit with separate connections to energise the synchronous motor as shown on sketch. It has a self winding spring loaded reserve movement which will keep the time switch in operation should the network voltage be interrupted, thus affecting the synchronous motor driving the time switch mechanism.

Time Dials

The time dials rotate in a clockwise direction and are marked 1 to 24 hours with 10 minute subdivisions, number 24 being midnight, a black shaded section from 18.00 hours to 6.00 hours denoting the night period.

There is a small dial located near the top right hand corner of the time switch which is marked in minutes and geared with the 24 hour time dial to permit accurate setting.

The tariff and power switches, mounted one above the other, are operated by switching riders situated on the time dials, the rear, larger dial having short switching riders, the front, smaller dial having longer switch riders.

The green switch riders close the switch contacts and the blue switch riders open the switch contacts.

Spare switching riders are mounted inside the case on a movable arm and will be used where necessary for extended off peak rates.

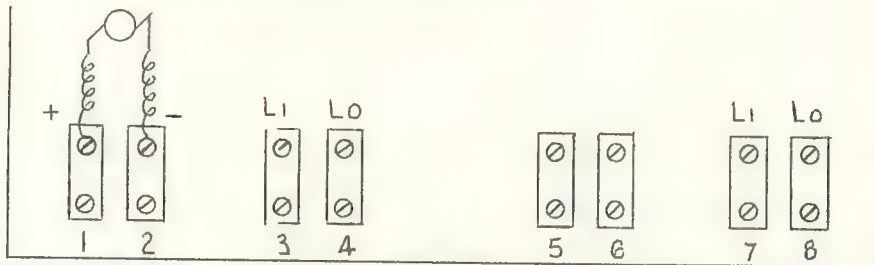
Item No. 23 (Cont'd)

To reset switching riders slacken the locking screw, move switch rider to position and tighten locking screw.

The time dials must only be moved in clockwise direction as indicated by arrow on dial.

Note: The sealing screw holding the plastic inspection cover must be loosened before cover can be removed by turning to left.

Terminal Block at Bottom of Time Switch



The terminal block is connected as shown in sketch. Terminals 1 and 2 are connections for active and neutral to energise the T/S synchronous motor, 3 and 4 are the line and load terminals connected to the rear switch mechanism and operated by switch riders on large rear dial, 7 and 8 are the line and load terminals connected to the front switch mechanism and operated by switch riders attached to the front dial. Water heaters shall be connected to terminals 3 and 4 and the space heaters to terminals 7 and 8.

Time Pointer

The time pointer is red and is attached to the centre spindle and points toward the bottom right hand side of clock dial.

This pointer remains stationary as the dial rotates; the pointer indicates the time on the dial.

Action by Emergency Service Officers

Officers attending premises and finding this type of Time Switch installed, shall not "cut in" the Time Switch but inform the customer that the defect (if any) has been adjusted, and water should be available after the appropriate heating period.

If sickness in home or similar circumstance causing hardship, or the job is being referred to E.D.S. for further attention the Time Switch may be cut in, but will switch off at the next off cycle. If continuous heating is required for a period of

Item No. 23 (Cont'd)

two or more days the line and load leads from the water heater shall be removed and bonded together. The Time Switch must then have a bridging label attached, addressed to Branch applicable.

Item 24

Time Switches

WARBURTON FRANKI SPRING RESERVE TIME SWITCH TYPE WF12

Description

The time switch is provided with a self-starting synchronous motor, with an electrical and manually wound spring reserve, which automatically maintains operation when supply is interrupted.

The spring driven mechanism is brought into operation by a thermal bimetallic starting device which imparts a "kick" to the balance wheels to ensure reliable starting.

Specification

Single pole	Single dial	240 V
Rated current	30A resistive	0.95 P.F.
Rewind time 24 hrs.		Spring reserve 24 hrs

Time Dials (see illustration)

The time is shown on the hour dial by a RED pointer and on a minute dial partly beneath and to the right of the hour dial, by a BLACK pointer marked on the assembly plate.

Operation

The motor operation may be observed through an aperture on the left of the dial and when spring mechanism is working, the second hand on the lower right side of the dial operates and a definite ticking sound can be heard.

Procedure

The switch contacts may be observed through an aperture on right bottom corner of the cover.

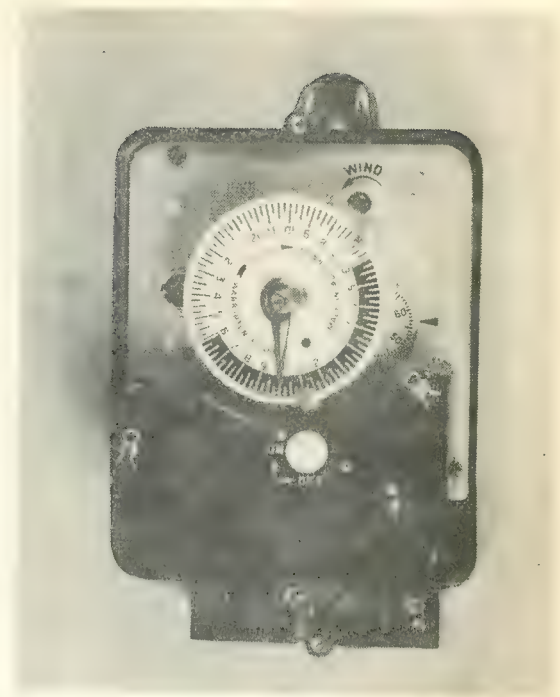
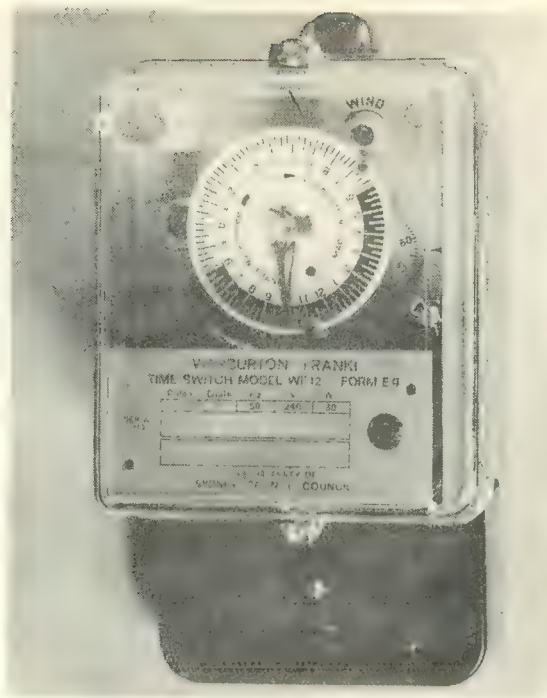
The switch may be operated by removing the cover and moving the WHITE knob in the appropriate direction.

Note: Do not rotate dial to check switch operation.

1. Check that motor is operating and is on time \pm 15 minutes.
2. If incorrect time, and there have been no known interruptions exceeding 24 hours, bridge the time switch and refer to M.S. for replacement.
3. When an interruption exceeding 24 hours is known, reset the time switch as follows:-
 - (a) Set minute dial on 60 by rotating small dial clockwise.
 - (b) Set hour dial to proceeding hour, i.e. at 2.35 p.m.,

set for 35 - this action rotates hour dial to correct position.

4. Check switching operation by operating manual knob only, do not rotate dial.



CONNECTIONS :-

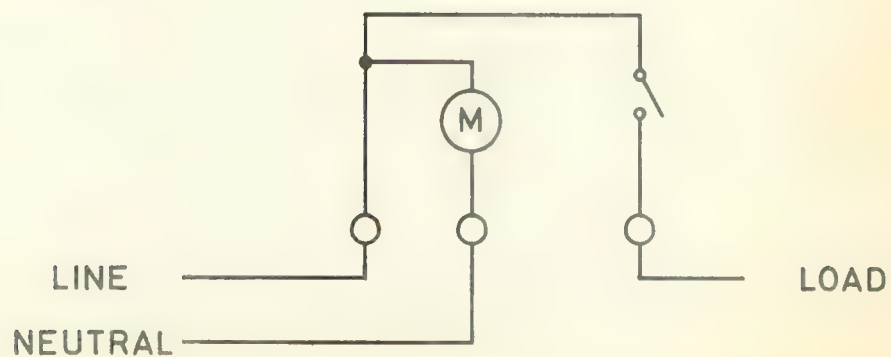


FIGURE 21 D

WARBURTON FRANKI TYPE WF 12 - (30 AMP. SINGLE POLE)
SPRING RESERVE SYNCHRONOUS TIME SWITCH

SECTION NO. 9.

ELECTRIC MOTORS.

- Item No. ~~1. Motors Hired to Customers By The Sydney County Council.~~
- ~~2. Connection of Hired Motors.~~
- ~~3. Replacement of Defective Motors.~~
- ~~4. Repair of Hired Motors.~~
- ~~5. Arrangements For Repairs.~~
- ~~6. Motors Hired Temporarily to Replace Privately Owned Motors.~~
- ~~7. Withdrawal of Motors and Starters After General Working Hours.~~
- ~~8. Hired Motors Damaged at Customers' Premises.~~
- ~~9. Unsuitability of S.C.C. D.C. Motors For Automatic Refrigerators.~~
- ~~10. Motors Hired Into Bulk Supply Areas.~~
- ~~11. Motors Hired Into Areas Served By Other Supply Authorities.~~
- ~~12. Undertaking Forms.~~
- ~~13. Details To be Shown When Reporting on Hired Motors.~~
14. Direct Current Motor Troubles.
15. Alternating Current Motor Troubles.
16. Operation of A.C. Starters.
17. Checking Star-Delta Motor or Switch Connections.
18. Motor Current Table.
19. Methods of Reversing Various Types of Motors.
20. Pulley Calculations.
21. Single Phase Motors.
22. Thermal Overcurrent Protection.
23. "M.E.M." Motor Control Gear.
24. "Security" Control Equipment.
25. "A.G.E." Control Equipment.

ITEM No. 14. DIRECT CURRENT MOTOR TROUBLES.Failure to start.

- (i) Make sure that supply is available at control switch and that fuses are in order.
- (ii) Check external connections with the diagram and see that each connection is tight.
- (iii) See that the brushes gear on the surface of the commutator evenly and with reasonable pressure.
- (iv) Check external wiring for open circuit.
- (v) Examine starter for open circuit and bad contact between arm and contact studs.

Motor blows fuse at starting.

- (i) Make sure that the drive is free and that the motor is not overloaded at starting.
- (ii) Start as slowly as possible.
- (iii) Check capacity of fuses.
- (iv) Check shunt circuit for continuity.
- (v) Test for earth on the motor.

Excessive Speed on Starting.

If the motor starts, and speed increases until the motor runs at very excessive speed, the shunt coil is connected in series with the armature instead of in parallel. The motor should be stopped immediately as such a condition would cause damage to the coils and/or armature in a very short space of time.

Starter Defects.

- (i) If the last few coils of the resistance overheat (probably smoke or get red hot) the fuse blows or overload acts, or motor sparks, it indicates motor overloaded or starter too small.

When a motor starts against a load having considerable inertia, such as heavy line shafting with several large pulleys and tight belts, time must be given for the motor to accelerate the load. If the starter is moved over the contacts more quickly than the motor can accelerate, an excessive current will pass, causing the motor to spark. In these circumstances, the starter must be put on more slowly, and this will cause it to heat up unless it has been liberally rated.

ITEM NO.14 (CONT'D).

- (ii) If the motor does not start nor take current until the starter handle has been moved some distance and then starts suddenly, check for break in starting resistance.

Sparking at the Brushes.

- (i) Excessive sparking or flashing at brushes may be due to -

Rough commutator
 Low bar on commutator
 High bar on commutator
 High mica on commutator
 Brushes too short
 Insufficient brush tension
 Weak brush springs
 Brushes sticking in holders
 Dirt or oil on commutator
 Water dripping on commutator
 Short or open circuit in armature winding. (A broken wire in the armature winding will cause severe sparking and flashing apparently all around the commutator).

- (ii) If rotation has been changed see that the brush position has been reset to the position giving sparkless commutation.

Brush arms should not be interfered with except when necessary to set the brush holders to 1/16" from commutator surface.

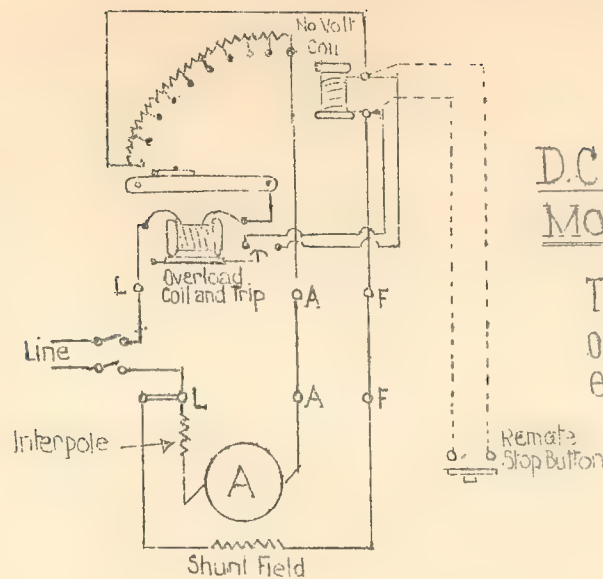
Overheated Bearings.

A hot bearing may result from any of the following causes:-

- (a) Poor or insufficient oil.
- (b) Oil rings sticking.
- (c) Too much grease in ball or roller bearings.
- (d) Excessive friction caused by dirt or grit in the bearings.
- (e) Bearings out of line.
- (f) Side pull due to tight belts.
- (g) Bearings too tight.
- (h) Heat conducted from the shaft due to hot armature or commutator.
- (i) Bent armature shaft.

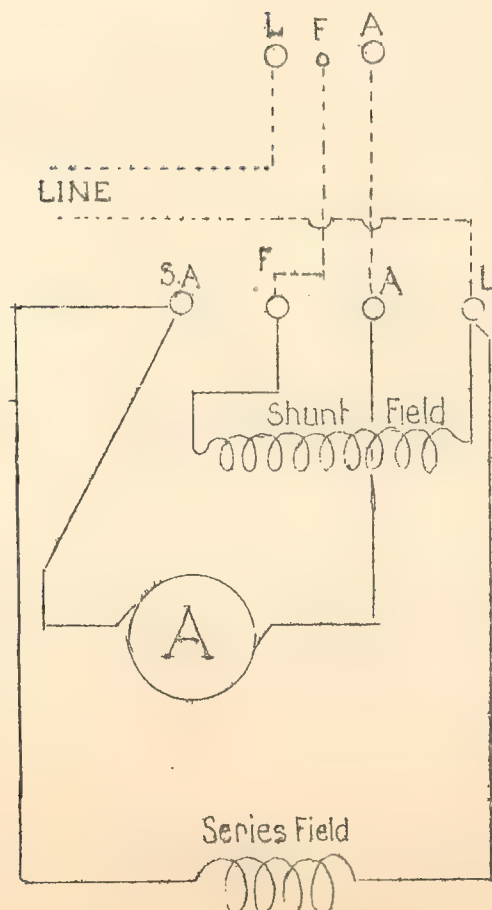
Motors with overheated bearings should be kept running with reduced or no load and the overheated bearings allowed to cool gradually.

Gradual cooling may be effected by frequent pouring of oil into the oil well, taking care to place a vessel beneath the bearing to take the overflow. Assistance may be gained from a fan cooling the surrounding atmosphere.



D.C. SHUNT INTERPOLE MOTOR AND STARTER

To reverse direction of rotation
of Motor change over the two
ends of field winding in
terminal box of Motor.



CONNECTIONS OF WEST COMPOUND MOTOR

To change direction of
rotation of Motor,
reverse armature leads only
at SA and A.

ELECTRIC MOTORS.ITEM NO. 14 (CONTD).

Cold water should not be applied to the outside of a hot bearing as this may cause the bearing to **contract** and seize the shaft.

Bearings which have been overheated should be examined before the motor is used again.

ITEM NO. 15. ALTERNATING CURRENT MOTOR TROUBLES.Failure to start.

- (i) Make sure that supply is available at the control gear.
- (ii) Check external connections with diagram and see that each connection is tight.
- (iii) See that brushes are bearing evenly on the sliprings.
- (iv) Check external wiring for open circuit.
- (v) Examine rotor starter for open circuit.
- (vi) Examine stator switch for bad contacts.
- (vii) Overloaded. Check with customer for added load.
- (viii) If motor has been changed and a starting transformer is used, it may be necessary to change to higher voltage tapping to give increased torque.

Over-current Trips Operate at Starting.

- (i) Make sure that drive is free and that the motor is not overloaded at starting.
- (ii) Start as slowly as possible.
- (iii) See that the time lags are correctly adjusted and filled with the correct quantity of suitable oil, if of the oil-filled type.
- (iv) Check supply voltage.

Motor Overheats.

- (i) Overloaded.
- (ii) The motor may be wrongly connected. Check connections from rating plate of motor, and connection diagram.
- (iii) Ventilation ducts may be choked with dirt.
- (iv) Slipring motor not designed for variable speed may be operating continuously at a low speed.
- (v) The temperature of the surrounding air may be high. The motor may develop a maximum temperature of 180°F. with safety after running on full load for six hours. A thermometer provides the only reliable temperature check.
- (vi) Check for high resistance rotor. If a 1500 r.p.m. motor (no load speed) falls away to about 1350 r.p.m. on normal load, a H.R.R. is indicated.

Workshop practice is to remove rotor and weld rotor bars to end rings. If rotor bars are of aluminium nothing can be done as bars and end rings are cast in one section and H.R.R. would possibly be due to cracked rotor bars in slots.

ITEM NO. 15 (CONTD).Overheated Bearings.

A hot bearing may result from any of the following causes:-

- (a) Poor or insufficient oil
- (b) Oil rings sticking.
- (c) Too much grease in ball or roller bearings.
- (d) Excessive friction caused by dirt or grit in the bearings.
- (e) Bearings out of line.
- (f) Side pull due to tight belts.
- (g) Bearings too tight.
- (h) Heat conducted from the shaft due to hot rotor.
- (i) Bent rotor shaft.

Motors with overheated bearings should be kept running with reduced or no load and the overheated bearings allowed to cool gradually.

Gradual cooling may be effected by frequent pouring of oil into the oil well, taking care to place a vessel beneath the bearing to take the overflow. Assistance may be gained from a fan cooling the surrounding atmosphere.

Cold water should not be applied to the outside of a hot bearing as this may cause the bearings to contract and seize the shaft.

Bearings which have been overheated should be examined before the motor is used again.

"Single Phasing".

Statistics show that the majority of burn-outs on three-phase machines are caused by "single phasing".

If one supply line to a three-phase motor is disconnected after the motor attains full speed, the motor will continue to run and develop power, although it is then virtually running on a single-phase supply. If the motor is called upon to develop anything approaching its rated output, the current drawn from the line, and therefore passed through its windings, is considerably in excess of the current for which the motor is designed and part of the motor windings will overheat and in time burn out.

One cause of "single phasing" is the use of fuses as over-current protection for the motor. The starting current of a motor is often considerably more than the normal full load current and the fuses must be rated high enough to avoid blowing when starting up. They are thus rated far too high to provide any measure of protection for the motor windings. When the motor is started, the fuses run hot for quite an appreciable time due to the current value approaching the fusing current. This results in oxidation of the fuses and in time one fuse will blow when starting up. The motor will continue to run and although the line current

ITEM NO. 15 (CONTD).

may not be high enough to blow the remaining fuses, the current in the motor windings is much too high, resulting in a burn-out.

A further cause of "single phasing" is a faulty switch or contact, which breaks one line after the motor has started up.

In order to prevent "single phasing" it is necessary to instal starters having over-current releases sufficiently sensitive to trip when the current rises to a dangerous level. Time lags fitted to magnetic over-current releases will ensure that the starter does not trip on momentary overloads. Thermal over-current releases have an inherent time lag.

ITEM NO. 16. OPERATION OF A.C. STARTERS.(i) Squirrel-Cage Motors.

Starters arranged for switching squirrel-cage motors direct on the line may be either the two-position ("off" and "run") or three-position ("Off", "start" and "run"). With two-position and push-button starters, the motor is started by simply moving the starting handle smartly over to the "run" position, or pressing the "start" push button.

Three-position direct starters are arranged to cut out the over-current releases in the "start" position and the motor should be started by moving the starter handle into the "start" position. When the motor has attained full speed, the handle should be moved smartly over to the "run" position. The starter handle will remain in the "run" position, but it must be held in the "start" position, as it will return to the "off" position when released.

When star-delta or auto-transformer starting is employed, the starter handle should be moved smartly into the "start" position. The motor should immediately start and run up to a constant speed. When this is attained, the starter handle should be moved smartly over to the "run" position. The starter handle will remain in the "run" position, but must be held in the "start" position exactly as in the case of the three-position direct starters. If the motor does not start, the starter handle should be released immediately, and not moved over to the "run" position since this would result in an excessive and possibly harmful current.

(ii) Slip-Ring Motors.

Before starting up, the handle of the rotor resistance should be in the starting position and the slip-rings of the motor should be open circuited that is, the handle of the short circuiting gear (if fitted) in position towards the motor.

The motor is started by closing the stator switch and moving the starter resistance handle slowly from step to step, allowing time for the motor to gain speed, before moving to the next step. When the starter handle

ITEM NO. 16 (CONTD).

has reached the last step (full on) the slip rings on the motor should be short circuited by moving the handle on the slip ring cover smartly over to the "run" position (handle away from motor).

The short circuiting gear should not be moved slowly or the operating gear will tend to wear.

When starters having one handle only are used, it will be found that this is either spring loaded to return to the "off" position, or that it must be returned to the "off" position before a start can be made.

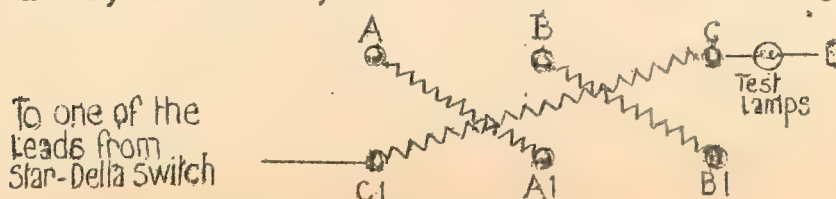
When shutting down, the stator switch should always be opened before the rotor is open circuited.

ITEM NO. 17. CHECKING STAR-DELTA MOTOR OR SWITCH CONNECTIONS.

When a check of star-delta connections is necessary at the motor or switch or both, the following procedure is recommended:-

- (a) Open the star-delta terminal box and with test lamps, test for supply O.K. at line terminals. There should be three leads in to line terminals and six leads out to motor. If star-delta switch is disconnected, connect line leads to line terminals and each lead to the motor to any one of the six terminals.
- (b) Remove terminal cover at motor and disconnect the six leads that come from the star-delta switch and leave clear of motor terminals.
- (c) Place star-delta switch in start (star) position. Ignoring markings (letters or numerals), test leads at motor terminal block, one at a time, between lead and earth. Three leads will be found alive. Place these three leads adjacent to bottom terminals.
- (d) Place star-delta switch in run (delta) position. Place the remaining three leads that come from the star-delta switch, adjacent to the top terminals at motor in such order that the test lamps will not glow when connected between opposite leads.
- (e) With the star-delta switch still in run position and with the leads from the star-delta switch still disconnected at the motor terminals, check windings at terminal block for connection in standard manner.

Connections are correct if test lamps glow when connected in series with A and A1, or B and B1, or C and C1 to earth (See diagram).



- (f) Connect all leads permanently.

ELECTRIC MOTORS.ITEM NO. 18. MOTOR CURRENT TABLE.

ALTERNATING CURRENT			DIRECT CURRENT		
Approx.amps per phase taken by induction motors of average efficiency.			Approx.amps taken by direct current motors of average efficiency.		
H.P.	Single phase 240 volts	Three phase 415 volts	240 volts	480 volts	H.P.
$\frac{1}{8}$	1	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{8}$
$\frac{1}{4}$	2	$\frac{1}{2}$	1	$\frac{3}{4}$	$\frac{1}{4}$
$\frac{1}{2}$	$3\frac{1}{2}$	1	$2\frac{1}{2}$	$1\frac{1}{4}$	$\frac{1}{2}$
1	8	2	5	2	1
$1\frac{1}{2}$	9	$2\frac{1}{2}$	7	3	$1\frac{1}{2}$
2	13	$3\frac{1}{2}$	$9\frac{1}{2}$	4	2
$2\frac{1}{2}$	14	4	11	$5\frac{1}{2}$	$2\frac{1}{2}$
3		5		$5\frac{1}{2}$	3
4		6		8	4
5		$7\frac{1}{2}$		10	5
$7\frac{1}{2}$		$11\frac{1}{2}$		15	$7\frac{1}{2}$
10		$14\frac{1}{2}$		19	10
$12\frac{1}{2}$		18		24	$12\frac{1}{2}$
15		21		30	15
20		29		40	20
30		41		57	30
40		55		80	40
50		68		95	50
60		80		100	60
70		92		120	70

A table of the permissible starting current of A.C. motors is contained in Rule 30 of the Sydney County Council's Service and Installation Rules :-

(a) Single Phase 240 Volt Motors. The starting current of a single phase motor, measured by a damped ammeter, must not exceed 20 amperes. (See Rule 2 (J) regarding maximum size of single phase motors).

(b) Three Phase Motors. The starting current of a three phase motor, measured by a damped ammeter, must not exceed the following :-

For motors not exceeding 2 H.P.

16 amperes

For motors exceeding 2 H.P. but not exceeding 6 H.P.

(H.P. X 8) amperes.

For motor rated at more than 6 H.P.

(H.P. X 2.5) + 33
amperes.

ITEM NO. 18 (CONTD).ELECTRIC MOTORS.

For motors which are not frequently started or stopped, whichever of the following values is the greatest:-

- (i) (H.P. X 2.5) + 33 amperes.
- (ii) 0.75 X Total H.P. of motors installed *
- (iii) The starting current of the largest of the other motors installed, calculated in accordance with (i).

* "Total H.P." refers to the aggregate rating of motors connected for the consumer to the particular service, and includes the proposed motor.

ITEM NO. 19. METHODS OF REVERSING VARIOUS TYPES OF MOTORS.Three Phase A.C.

Change over any two cables feeding the starter.

Single Phase. Split Phase and Capacitors.

Change over ends of starting winding at motor terminal block.

Repulsion - Induction.

Move the brush rocker to the corresponding position on the other side of the neutral.

D.C. Shunt.

Change over two ends of shunt field connection at motor terminal block.

D.C. Series.

Change over two ends of cables feeding brush boxes or change over two series field connections at terminal block.

D.C. Compound.

Change over the armature or field connections, but not both.

ELECTRIC MOTORS.

ITEM NO. 20. PULLEY CALCULATIONS.

Diameter of Driver.

The diameter of the driver equals the product of the diameter and number of revolutions of the driven divided by the number of revolutions of the driver.

Diameter of Driven.

The diameter of the driven equals the product of the diameter and number of revolutions of the driver divided by the number of revolutions of the driven.

Speed of Driver.

The number of revolutions of the driver equals the product of the diameter and number of revolutions of the driven divided by the diameter of the driver.

Speed of Driven.

The number of revolutions of the driven equals the product of the diameter and number of revolutions of the driver divided by the diameter of the driven.

ITEM NO. 21. SINGLE PHASE MOTORS.

Unlike polyphase motors, a single-phase induction motor is not self-starting and therefore is provided with a starting winding or some other device to get the motor up to speed, when it will continue to run as a purely single-phase motor.

There are several different types of single-phase motors. Brief details of those most commonly used are as follows :-

Split-Phase Squirrel-Cage Induction Motor.

This has a solid rotor exactly the same as a 3-phase motor and the stator is wound with two windings - the running winding and the starting winding. The starting winding is usually only in circuit for a few seconds whilst the motor is getting up to speed, and is therefore usually wound to take the starting winding current for a short period only.

A common method employed to automatically cut out the starting winding in fractional horse-power single-phase motors is to fit a switch inside the motor, which is opened by centrifugal force when the motor is up to speed and closed again when the motor drops below a certain value. The main disadvantage of this is that the switch is liable to become dirty or worn and may eventually fail to operate and cause the starting winding to burn out.

ITEM NO. 21 (CONTD).ELECTRIC MOTORS.

The connections for this motor, which is switched direct-on-line, are shown in Figure 1.

The direction of rotation of the motor may be reversed by changing over the two ends of the starting winding at the motor terminal block.

Split -phase motors of 1 H.P. and over, require an external resistance or resistance and choke, to enable the motors to start.

For these, three terminals are provided, one common for starting and running winding marked AZ; one for the other end of starting winding marked Z, and the other for the running winding marked A, as shown in Figure 2. In this case the resistance in the starter is connected in parallel with the starting winding and these are connected in series with the running winding. As the motor gains speed, the starting handle is moved over, and it cuts out the resistance and the starting winding when in its final position.

Another method is for a choke to be connected in parallel with the starting winding, and these connected in series with a resistance and across the supply. The running winding is connected directly across the supply. When the starting handle is moved to its final position, everything is cut out except the running winding.

Another method is to use a resistance only.

Like the smaller split-phase motors, these develop very little starting torque and usually have to be started on no-load or on a very light load.

Capacitor Start Motor.

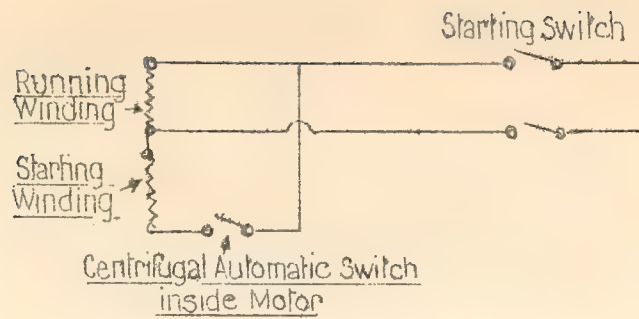
This is a split-phase motor with a condenser fitted in series with the starting winding. This gives the motor a high starting torque. The condenser and starting winding are cut out of circuit when the motor is up to speed, either by an automatic centrifugal switch in the motor or by an external manually or automatically operated switch.

Direction of rotation is changed in the same manner as for other types of split-phase motors.

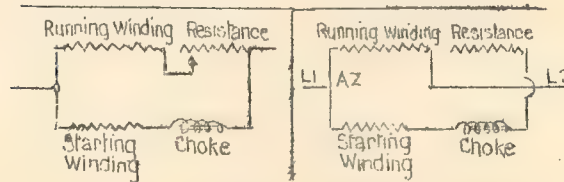
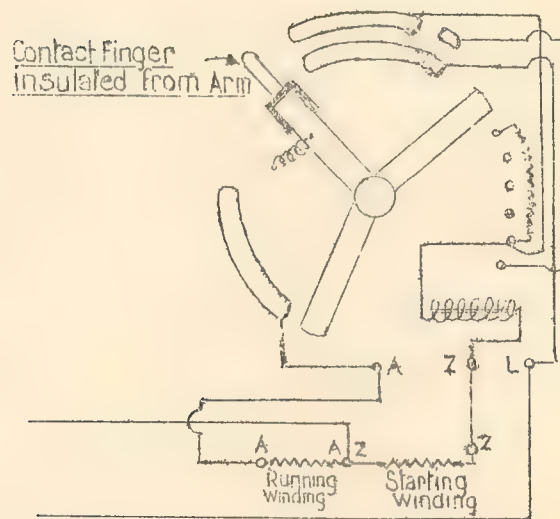
A defective condenser may be the cause of a motor failing to start. If correct size condenser is fitted, the motor should develop at least 75 per cent starting torque.

Capacitor Start and Run Motor.

This type has a portion of the condenser permanently in circuit and has the advantage of a higher overload capacity, better pull in torque and also improved power factor. The condenser is usually somewhat larger than normal.



SPLIT-PHASE SINGLE-PHASE MOTOR WITH INTERNAL SWITCH



Starting Position Running Position
SCHEMATIC DIAGRAMS OF ABOVE

SINGLE-PHASE STARTER CONNECTIONS WITH RESISTANCE AND CHOKE

ITEM NO. 21 (CONTD).Repulsion-Induction Motor.

The repulsion-induction motor has the appearance of a D.C. motor.

When the motor starts up and reaches full speed, a centrifugally operated device lifts the brushes and short-circuits all the commutator segments, and thus converts it into an induction motor. When the motor loses speed or stops, the reverse process takes place and it becomes a repulsion motor again.

This type of motor has a high starting torque as a repulsion motor and runs at a constant speed when it becomes an induction motor.

Brushes should be set 20 either side of neutral position.

It can be reversed by moving the brush rocker to the corresponding position on the other side of the neutral.

ITEM NO. 22. THERMAL OVERCURRENT PROTECTION.

Demand for more reliable motor protection resulted in the introduction of the thermal relay, of which many types have been developed. The two most widely known and popular types in use to-day depend for their operation upon the flexing of a bi-metallic strip or the change from solid to liquid (solder pot type).

The first of these consists of a bi-metallic strip which, under the influence of heat from a small coil carrying the motor current, is deflected when the motor current exceeds a certain value for a period of time beyond which it would be dangerous for the motor to operate. Flexing of the strip beyond a pre-determined limit results in the opening of auxiliary contacts in the no-volt release circuit.

The solder pot type consists of a copper tube having at its lowest extremity a solder pot containing a small quantity of low melting eutectic alloy into which is inserted a copper pin arranged to rotate and trip the auxiliary contacts of the relay immediately the motor current exceeds a safe value and melts the solder. The solder automatically resets after the relay has cooled down.

The primary purpose of the thermal relay is not short circuit protection, but to provide accurate protection against detrimental heating of the motor which, if allowed to persist, would ultimately result in damage to the insulation and eventual burn-out. It is imperative that the circuit be protected ahead of the relay by fuses or a circuit breaker of suitable rating to take care of short circuit or high current faults which could result in destruction of the relay itself.

All A.C. Sydney County Council hired motors of ratings up to 5 H.P. installed since 1948 are controlled by direct-on-line contactors incorporating thermal overcurrent and undervoltage protection.

ELECTRIC MOTORS.ITEM NO. 23. M.E.M. MOTOR CONTROL GEAR.

M.E.M. motor control gear is manufactured by Midland Electric Manufacturing Co., Ltd., England.

"Startet", "Memota" and "Auto-Memota" starters are designed for control of small three phase squirrel cage and certain other types of single and three-phase self-starting induction motors up to 15 H.P. maximum rating 25 amperes.

Details are as follows :-

1. "STARTET."

"Startet" is a push button manually operated starter in die-cast case for small motors taking from .3 to 4.5 amperes, $\frac{1}{8}$ to $\frac{1}{2}$ h.p., where no-volt release is not required.

"Startet" is suitable for A.C. motors, single or three-phase up to 415 volts and for D.C. up to 250 volts.

"Startet" is provided with overload trips of the same type as those used on the "Memota" and "Auto-Memota" range of starters, which automatically cut off the current before an overload is sufficient to injure the motor.

The thermal overload trips are provided with small movable clips which modify the position of the trip-bar. Each starter can be set for two current ratings only. When the "trip clips" are pulled outwards to their limit the overload trips are at the maximum rating. When the "trip clips" are pushed inwards to their limit, the overload trips are at the minimum rating.

The overload trips are adjusted to trip the starter at approximately 25% above rating.

2. "MEMOTA."

"Memota" starters are manually operated by side handle, are universal in their application and may be used upon all voltages and periodicities in common use upon power circuits. They can be set for all loads and sizes of motors within the limits of their design.

The no-volt release feature is specially constructed to ensure positive action, even with a fading voltage.

Three forms of "Memota" starters are:-

- (a) "Memota" Direct Starter for controlling A.C. motors up to 5 H.P. fitted with overload trips on two phases and no-volt release. May be used on single phase applications.

Rating $\frac{1}{2}$ - 5 H.P. - 1 - 9 amps.

ITEM NO. 23 (CONTD).ELECTRIC MOTORS.

- (b) "Memota" Star-Delta Starter for A.C. motors up to 10 H.P. Fitted with overload trips on three phases, no volt release, and correct sequence device. Can be used as a direct starter for single or threephase motors. Rating $\frac{1}{2}$ - 10 H.P. 1 - 15 amps.
- (c) "Memota" Split Phase Starter is a two-position starter for single phase cage motors, split phase type, having starting windings with or without condenser.

Each starter is fitted with two thermal overload trips, which are cut out in the "start" position. Correct sequence device is provided.

The starting winding is in circuit in "start" position and is cut out of circuit in "run" position.

SPECIFICATION FOR ALL TYPES.

Case. The starter is enclosed in an iron case. The cover is hinged and fastened by two hexagon nuts.

Trip Lever. A trip lever is provided for releasing the starter and stopping the motor by hand under normal running conditions. Remote control trip can be arranged by extending the no-volt coil circuit from the starter to any desired position.

Contacts. Round brass tips are fitted on the fixed contacts; These are reversible so that new surfaces can be presented to the moving copper contacts if necessary. The lever carrying the moving parts is readily removable for cleaning or renewal.

Overload Setting. A "load indicator" is incorporated in each starter with simple instructions for setting. The trips will operate at a minimum overload of approximately 20% to 30% above the current setting indicated on the scale.

Time lag varies inversely with overload, varying from about 15 seconds with 100% overload, to about 5 to 15 minutes with 25% overload, according to ampere rating.

Instructions. An instruction label with diagram of connections is fitted inside the cover of each starter.

3. "AUTO-MEMOTA."

"Auto-Memota" Starters are fully automatic, operated by push buttons. No-volt release is inherent.

M.E.M. MOTOR CONTROL GEAR

ITEM NO. 23 (CONTD).

ELECTRIC MOTORS.

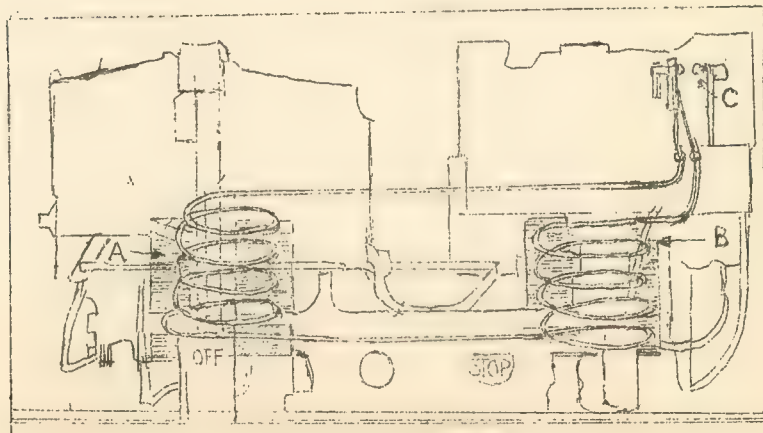
"Auto-Memota" Starters are made in three types:-

- (a) Direct Starters for switching direct on line. Suitable for single and three phase A.C. squirrel cage and certain other types of induction motors. Made in two sizes, $\frac{1}{8}$ to 5 H.P., .3 to 9 amps: and 5 to 15 H.P., 9 to 25 amps. Fitted with indirectly heated overload trips on three phases.
- (b) Star Delta Starters with automatic device for change-over from star to delta connection. Ratings 2 to 15 H.P. 3 to 25 amps.

Fitted with indirectly heated thermal overload trips on three phases.

"Auto-Memota" star delta starters consist of two contactors electrically interlocked. The change-over for star to delta connection, after starting, is quite automatic and is thus independent of the operator.

A change-over relay produces the change from star to delta connection in approximately 10 seconds. Simple adjustment during installation enables the time delay of the change-over to be modified to suit working requirements. The relay returns to the start position in approximately 20 seconds.



ITEM NO. 23 (CONTD).ELECTRIC MOTORS.

The illustration shows the manner in which the automatic change-over from star to delta connection is achieved. The cycle of operations is as follows :-

Upon pressing the start button the primary winding of coil "A" is energised and contactor "A" closes. A voltage is induced in the secondary winding of coil "A", producing a current which heats the thermal element of the change-over relay, causing it to close contact "C". Contactor "B" then closes. A voltage is then induced in the secondary winding of coil "B" which opposes that from coil "A", with the result that all secondary current ceases and the thermal element returns to the start position.

(c) Reversers for changing the direction of rotation of A.C. motors comprise two contactors, mechanically interlocked and provided with indirectly heated thermal overload trips on three phases. Each reverser supplied with built-in push button control stations. Suitable for control by limit switches.

Ratings $\frac{1}{8}$ to 15 H.P. .3 to 25 amps.

SPECIFICATION.

Case. The starters are enclosed in cast iron cases.

Push Button Control is built into each starter and is not detachable. Additional push button control stations may be connected where remote control is necessary.

Control By Thermostat, Float or Remote Single Switch. Direct or Star Delta starters thus used should be fitted with the M.E.M. Hand Reset Device which prevents automatic reclosing after the starter has opened due to overload or fault, until the fault has been cleared and the starter reset by hand.

Overload Setting. A "load indicator" is incorporated in each starter with simple instructions for setting. The trips will operate at a minimum overload of approximately 20% to 30% above the current setting indicated on the scale. Time lag varies inversely with overload from about 15 seconds with 100% overload to 5 to 15 minutes with 25% overload, according to ampere rating.

Diagrams of connections of "Auto-Memota" Starters are attached.

SERVICE NOTES.

The following notes may assist in diagnosing causes of unsatisfactory operation :-

(a) Magnet and Coil. The satisfactory operation of contactor type starters depends upon the effectiveness of the electro-magnet.

The magnet consists of two parts which are pulled together when they are energised by the coil. Each part has carefully ground

surfaces which meet and form a practically perfect joint. The energising coil is so designed that when used upon rated voltage and frequency, it will remain cool when continuously in circuit and give sufficient pull with reasonable freedom from noise when the ground magnet faces are clean and able to make really close contact.

Noise and chatter may be caused by unsuitable voltage or frequency or by the magnet faces not meeting perfectly. Dirt is a frequent cause of this and usually the cleaning of the faces reduces noise to a satisfactory minimum. Another cause of noise and chatter is too much pressure at the switch contacts. The manufacturer's setting should not be altered without good reason.

Overheating of coil may be caused by unsuitable voltage or frequency or by the magnet faces not meeting. Under normal conditions the temperature of the coil should not exceed 90°F above ambient temperature. In manually operated starters the coil may become excessively hot and eventually burn out if the plunger does not rise fully into the coil when the starter is closed. See that the plunger is free to move.

(b) Coil Circuit. All contacts, push button switches, float switches or other control points and all connections must be in good condition. Unsatisfactory operation of the starter may be due to faulty contact or bad connection in the coil circuit. In automatic starters the condition of the maintaining contact is sometimes overlooked. The maintaining contact in automatic starters is under the main contact and maintains the continuity of the coil circuit after the "On" button is released and the contactor has closed. It is important that the main contacts close slightly before the maintaining contact touches the main contact, otherwise the auxiliary contact may momentarily carry the full motor starting current and be damaged by burning.

(c) Failure On Starting Up may be due to the starting or stalled current of the motor being greater than the breaking capacity of the starter which is designed for use on motors taking starting currents not exceeding six times full load.

Intermittent contact in the coil may cause the starter to make and break repeatedly thus creating conditions conducive to flash-over. The trouble may also be caused by starters being employed on pressures in excess of their voltage rating.

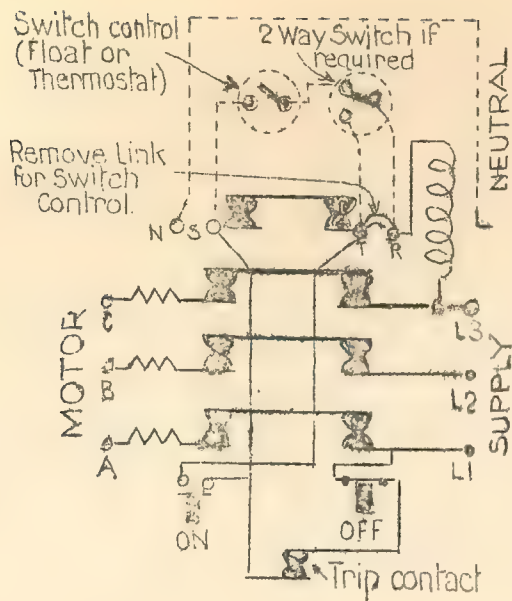
It sometimes happens that starters are used on motors taking a very large starting current with the load indicator incorrectly set, or occasionally the load may be a particularly heavy one so that the time required to reach full speed is abnormally long. In both these conditions the time lag of the overload trips may be insufficient and the starter may be required to open abnormally large currents. If under these circumstances the starter opens a current in excess of the breaking capacity failure is likely to occur.

In the manually operated starter, excessive starting current may cause the thermal elements to lift the trip bar, opening the coil circuit and causing the plunger to fall thus preventing the handle being "hooked" in the "on" position. In these circumstances, if the starter is held "on" by hand for a few seconds until the motor current becomes normal, the plunger will rise and allow the hook to hold the handle in position. In some cases of excessive wear, the end of the hook may be so worn that it does not hold on. In these cases the intelligent use of a small file will quickly remedy the defect.

(d) Excessive Vibration. M.E.M. starters are suitable for most positions but if mounted on certain types of machinery and power presses the severe vibration or shock may disturb the trip bar and trip the starter. The only really effective remedy for this is to move the starter to a position where the vibration or shock is less severe. The control push button could be on the machine itself and the starter mounted on an adjacent wall.

(e) Dirt. Another cause of trouble is that the covers are left open, permitting dust to enter the case. This causes dirty magnet faces and contact surfaces. Even where covers are kept closed, the interior of the starter should be periodically examined.

(f) Fully Automatic Control. Where the starter is controlled by thermostat, float or other single switch, it is essential that the starter be provided with a hand resetting device which prevents automatic reclosing after the starter has opened due to overload or fault. In such cases the motor will not re-start until the reset button has been pressed. If after pressing the reset button the switch will not stay in when the "start" button is again pressed, it is evident that there is a fault in the circuit which requires investigation and correction before the starter can again be used.



TO SET OVERLOAD TRIPS:

Move indicator to full Load Current of Motor. Trips will then operate at approximately 20% to 30% overload after attaining full Load Temperature.

Overload trip system is calibrated before leaving works & needs no further adjustment.

SINGLE PHASE MOTORS

Connect supply to L1 & L3 and Motor to A and C.

COIL - PHASE TO NEUTRAL

Remove coil lead from L3 and connect to N.

PUSH BUTTON CONTROL.

Starter as supplied is wired from Push button control only.

SWITCH CONTROL ONLY

Remove Link between terminals R and T.

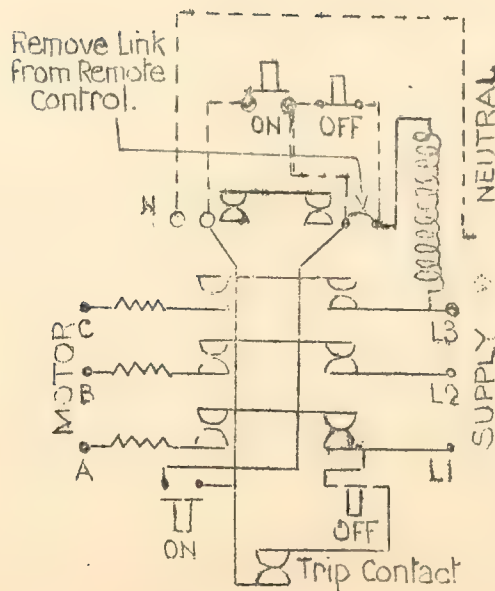
Connect Switch between terminals R and S.

SWITCH AND PUSH BUTTON CONTROL

Add 2 way switch and connect as diagram

AUTO - MEMOTA

DIRECT ON LINE (HAND RESET) STARTER.



TO SET OVERLOAD TRIPS

Move indicator to full Load current of Motor. Trips will then operate at approximately 20% to 30% overload after attaining full Load temperature. Overload trip system is calibrated before leaving works and needs no further adjustment.

SINGLE PHASE MOTORS

Connect supply to L1 and L3 and motor to A and C.

COIL - PHASE TO NEUTRAL

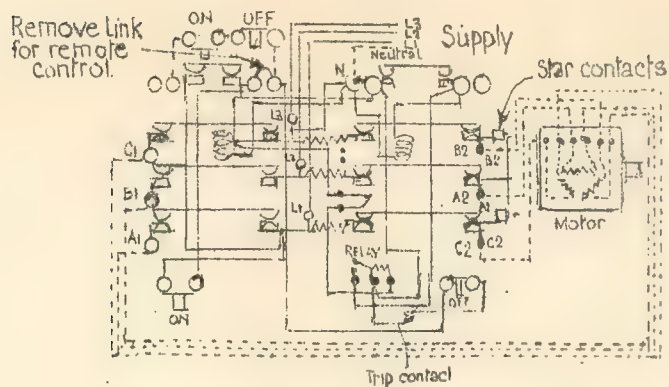
Remove coil lead from L3 and connect to N.

AUTO MEMOTA

DIRECT ON LINE STARTER N° 84 ADS.

M.E.M. MOTOR CONTROL GEAR

AUTO MEMOTA - STARTER FOR STAR-DELTA STARTING



CONNECT STARTER Terminals

A1, B1, C1, A2, B2, C2 to corresponding Terminals on Motor.

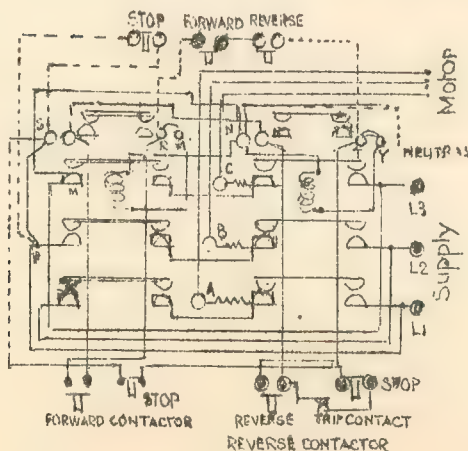
TO SET OVERLOAD TRIPS Move Indicator to full load current of motor. Trips will then operate at approximately 20% to 30% overload after attaining full load temperature. Overload Trip System is calibrated before leaving works and needs no further adjustment.

TO REVERSE DIRECTION of Rotation interchange any two supply Lines L1, L2, L3. CHANGEOVER RELAY is set to operate in approximately 10 Seconds when starting from cold in an ambient temperature of approximately 60° (52°). COIL-PHASE TO NEUTRAL Remove connection between L3 and N.

NOTE Blowing current of circuit fuses should not exceed 3 times maximum rating of overload trips.

AUTO MEMOTA REVERSER DIRECT ON LINE

For remote stops
Remove Link
between
S and P.



TO SET OVERLOAD TRIPS Move Indicator to full load current of Motor. Trips will then operator at approximately 20% to 30% overload after attaining full load temperature.. Overload trip System is calibrated before leaving works and needs no further adjustment.

COIL-PHASE TO NEUTRAL remove connection between terminals MN and connect neutral supply wire to terminal N. LIMIT SWITCHES remove Links and fit Limit Switches between terminals RX & TY. REMOTE STOPS remove link and insert stops between terminals SP.

NOTE: blowing current of circuit fuses should not exceed 4 times maximum rating of overload trips.

ITEM NO. 24. "C.P. SECURITY" CONTROL EQUIPMENT.

"Security" Control Equipment is manufactured by Security Pty. Ltd. Mascot, N.S.W.

Details of the equipment are as follows :-

1. 303 DIRECT-ON-LINE STARTER.

(i) Construction.

The C.P. "Security" 303 D.O.L. Starter consists of a magnetic contactor, together with double pole thermal relay and integrally mounted three-wire "Start-stop" push button station, enclosed in a bakelite case.

The contactor is rated at 15 amps. continuous capacity and consists of a "U"-shaped magnet and armature to which is attached a moulded bridge carrying the moving contacts.

Contacts are double break, self-aligning, with solid forged fine silver tips securely rivetted to contact plates and moving contact bridges.

Thermal Relay is a double pole solder-pot type with circuit opening contacts and hand reset button projecting through the starter cover. The solder used in the relay is a low melting point eutectic alloy.

Tripping of the relay is initiated through melting of the alloy by heater coils individually fitted to provide for operation in accordance with the ampere-rating of the motor for which the starter is to be used. This provides in the relay a thermal characteristic approaching as nearly as possible that of the motor thus ensuring stable and consistent response to all fault conditions within the motor.

The thermal relay is provided to give protection only against overloads within the motor which, if allowed to occur, would injure the windings. It will not give protection against circuit faults. Regulations require that all motor circuits must be protected by fuses or similar safeguards.

Heater Coils. The normal operating temperature of the heater coil is 80 - 100 degrees C., depending upon ambient temperature and the current carried.

Heater coils must be selected in accordance with the ampere-rating of the motor from the table shown in Appendix "A" to this Item. Under no circumstances should coils be selected by H.P. rating.

To instal heater coils, remove terminal screws at sides of thermal relay. Insert heater coils in the cavities surrounding the central tubes, replace and tighten terminal screws.

(ii) Alternative Methods of Control.

Although the "303" is fitted with an integrally mounted push-button station, the control circuit provides for the use of remote three-wire push-button control or two-wire control such as thermostat, pressure switch, float switch, etc. on either phase to phase or phase to neutral voltages. These alternatives are achieved in the following :-

- (a) For Local Control from integrally mounted P.B. station, the metal coverplate over the push-buttons is removed and discarded.
- (b) For Remote P.B. Control no change is necessary, connections merely being made to the appropriate terminals. If integral as well as remote control is required, P.B. coverplate is discarded. For remote control only, coverplate must be inverted so as not to interfere with movement of integral push buttons.
- (c) For Two-Wire Control by pressure switch, thermostat or float switch etc., the metal coverplate over push-buttons must be left in position. The two wires from the control device are then simply connected to the appropriate terminals.

With the contacts of the two-wire control device open, the starter can then be tested by removing the bakelite cover, which establishes three-wire control through the integral push-buttons.

- (d) Operating Coils can be supplied for use on either phase to phase or phase to neutral voltages. Coils are interchangeable without difficulty or alteration to wiring, the neutral being brought direct to the coil terminal by removal of a bridge link.

Connections are shown in the diagram forming Appendix "B" to this Item.

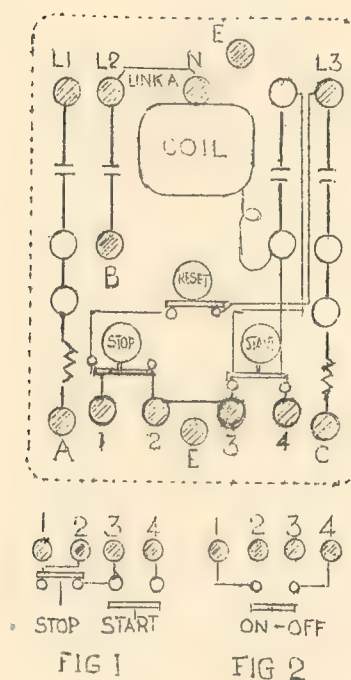
(iii) Installation.

The starter must be installed in a vertical position free from vibration.

Continuous earthing is provided through the metal back plate of the starter and two suitable terminal posts rivetted to the back coverplate.

"SECURITY" 303 DIRECT-ON-LINE STARTER

Connections Diagram.



Connect supply to L1, L2, L3 and motor to A, B, and C.
If operation is on phase to neutral voltage, remove Link A between L2 and N and connect neutral to N.

For Local three-wire P-B. control remove coverplate from front of Starter and replace screw.

For remote P-B. control remove Link B between 2 and 3 and connect as shown in FIG 1

For Two-wire control connect as shown in FIG 2 leaving coverplate in position on front of Starter.

APPENDIX "A".

"SECURITY" 303 D.O.L. CONTACTOR.

THERMAL OVERLOAD HEATER COILS.

Motor Amps.		Heater Coil Number	Motor Amps.		Heater Coil Number
Min.	Max.		Min.	Max.	
0.63	0.69	HC 111	3.93	4.02	HC 140
1.01	1.10	HC 121	4.03	4.37	HC 141
1.11	1.16	HC 122	4.38	4.67	HC 142
1.17	1.28	HC 123	4.68	4.86	HC 143
1.29	1.35	HC 124	4.87	5.18	HC 144
1.36	1.45	HC 125	5.19	5.67	HC 145
1.46	1.53	HC 126	5.68	6.08	HC 146
1.54	1.65	HC 127	6.09	6.38	HC 147
1.66	1.81	HC 128	6.39	6.83	HC 148
1.82	1.96	HC 129	6.84	7.28	HC 149
1.97	2.16	HC 130	7.29	7.84	HC 150
2.17	2.31	HC 131	7.85	8.64	HC 151
2.32	2.41	HC 132	8.65	9.14	HC 152
2.42	2.56	HC 133	9.15	10.27	HC 154
2.57	2.71	HC 134	10.28	10.78	HC 155
2.72	2.96	HC 135	10.79	11.52	HC 156
2.97	3.22	HC 136	11.53	12.82	HC 158
3.23	3.47	HC 137	12.83	13.78	HC 159
3.48	3.62	HC 138	13.79	15.33	HC 160
3.63	3.92	HC 139.			

2. "SECURITY" NO. 361 AUTO TRANSFORMER STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button station.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

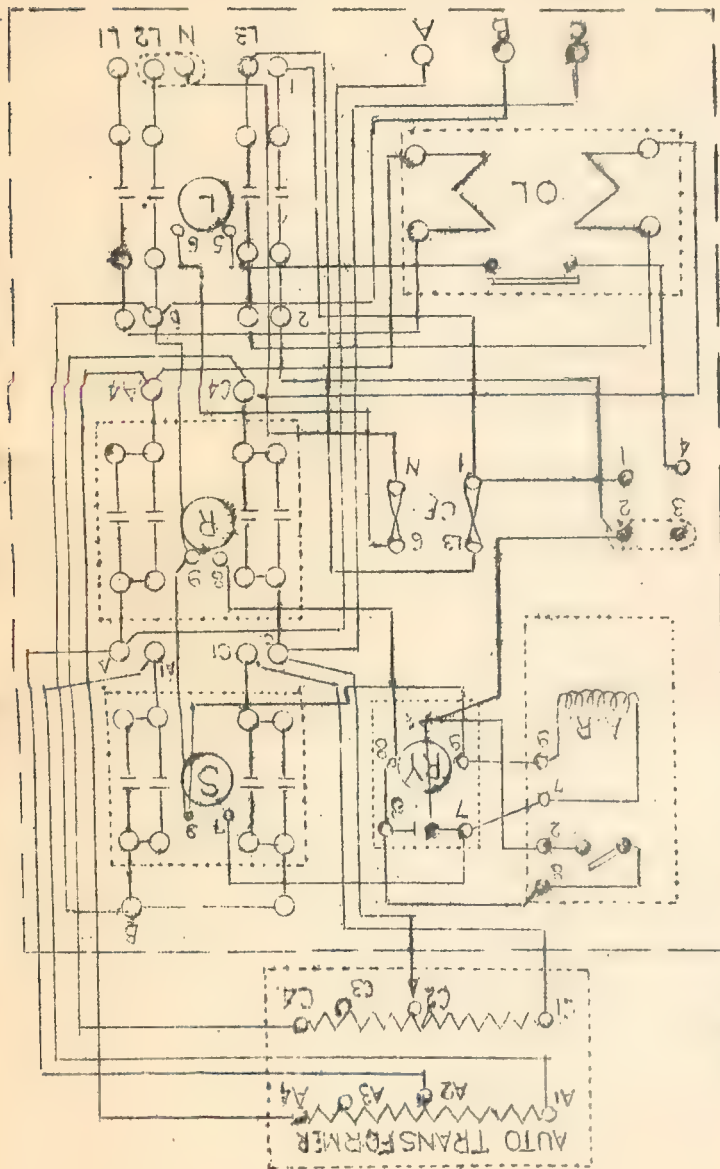
OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

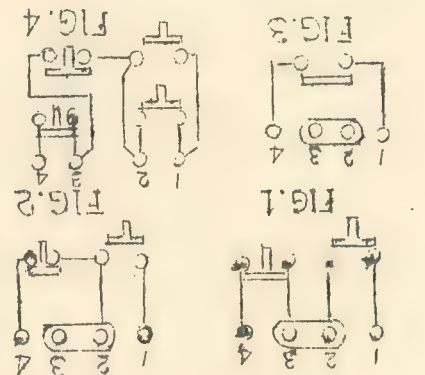
CONNECTIONS. A diagram of connections is attached. Before leaving the factory the starter is connected to the 70% auto transformer tapplings A2 and C2. Should the motor not start under these conditions change to the 80% tapplings A3 and C3.

CONNECTIONS FOR "SECURITY" No 361 AUTO TRANSFORMER STARTER.

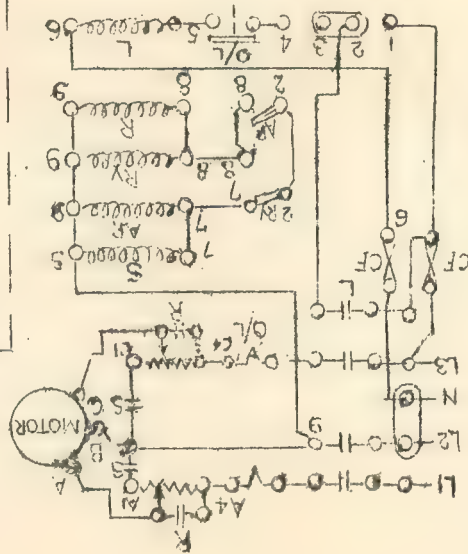


Back of Panel Diagram

Connect line to terminals L1, L2, L3 and motor to terminals A, B, C.



Schematic Diagram



Motor No	Motor Amperes	Motor HTR NO	Motor Amperes
H 37	3.16-3.52	H 44	11.2-13.3
H 38	3.53-4.63	H 45	13.4-16.1
H 39	4.64-5.18	H 46	16.2-17.9
H 40	5.19-6.47	H 47	18.0-22.7
H 41	6.48-7.52	H 48	22.8-25.0
H 42	7.93-9.84	H 49	25.1-29.5
H 43	9.85-11.1	H 50	29.6-34.5

3. "SECURITY" NO. 349. STAR DELTA STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button station.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

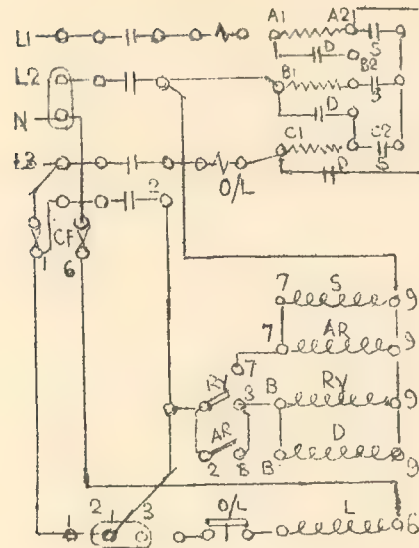
OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

A diagram of connections is attached.

CONNECTIONS FOR No.349 STAR DELTA STARTER



Schematic Diagram



FIG. 1

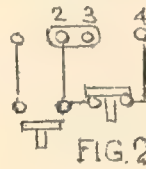


FIG. 2

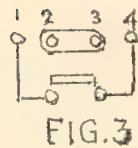


FIG. 3

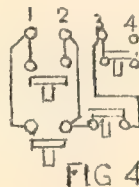
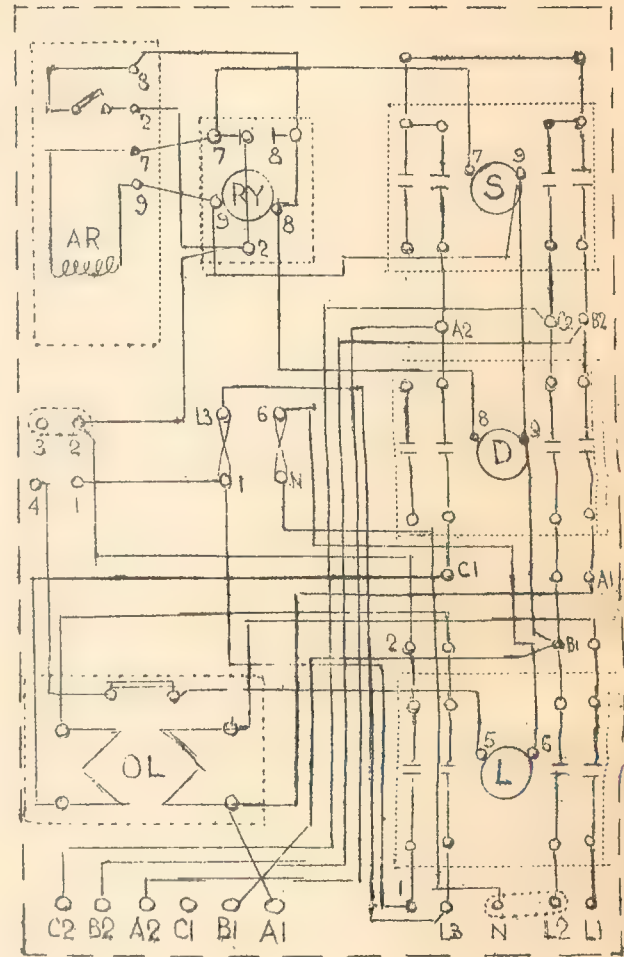


FIG. 4



Hfr No	MOTOR AMPERES	Hfr No	MOTOR AMPERES
H 27	3.16 - 3.52	H 44	11.2 - 13.3
H 38	3.53 - 4.63	H 45	13.4 - 16.1
H 39	4.64 - 5.18	H 46	16.2 - 17.9
H 40	5.19 - 6.47	H 47	18.0 - 22.7
H 41	6.48 - 7.92	H 48	22.8 - 25.0
H 42	7.93 - 9.84	H 49	25.1 - 29.5
H 43	9.65 - 11.1	H 50	29.6 - 34.5

Connect incoming Line to terminals L1, L2 and L3.

Connect terminals A1-A2, B1-B2, C1-C2 to corresponding terminals of the motor

2. "SECURITY" NO. 361 AUTO TRANSFORMER STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button station.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

CONNECTIONS. A diagram of connections is attached. Before leaving the factory the starter is connected to the 70% auto transformer tappings A2 and C2. Should the motor not start under these conditions change to the 80% tappings A3 and C3.

3. "SECURITY" NO. 349. STAR DELTA STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button station.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

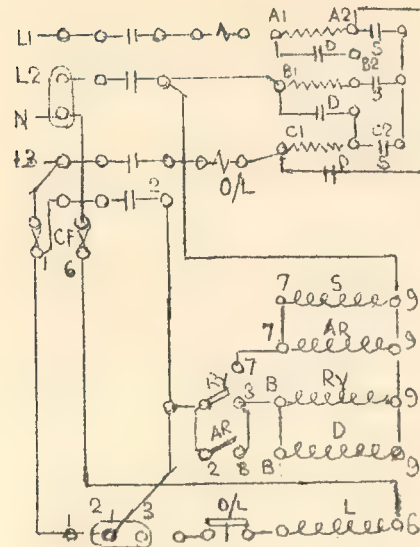
OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

A diagram of connections is attached.

CONNECTIONS FOR No.349 STAR DELTA STARTER



Schematic Diagram



FIG. 1

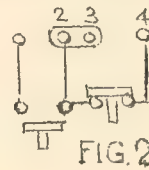


FIG. 2

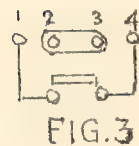


FIG. 3

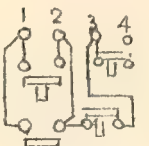
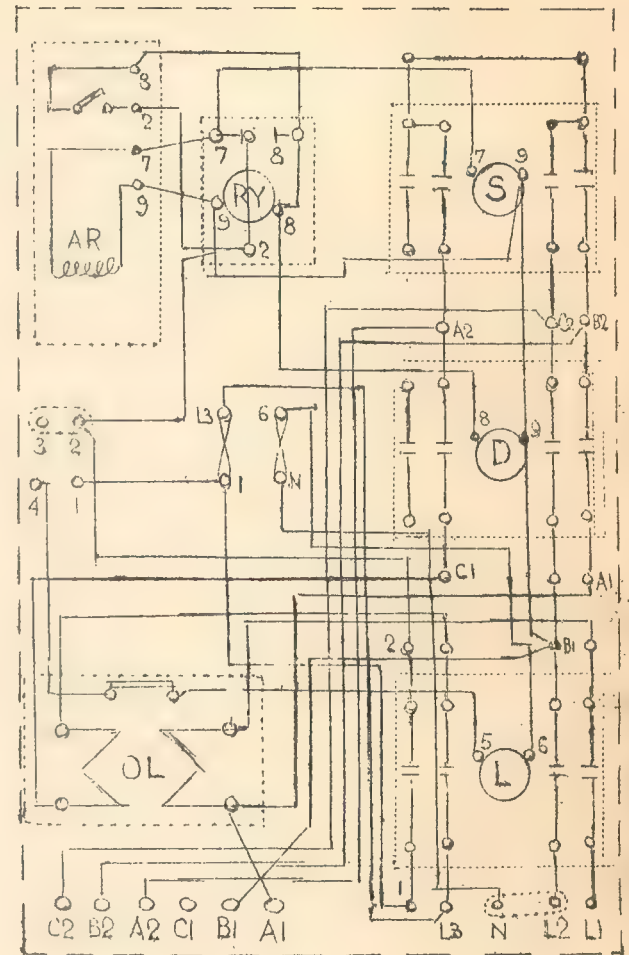


FIG. 4



Hfr No	MOTOR AMPERES	Hfr No	MOTOR AMPERES
H 37	3.16 - 3.52	H 44	11.2 - 13.3
H 38	3.53 - 4.63	H 45	13.4 - 16.1
H 39	4.64 - 5.18	H 46	16.2 - 17.9
H 40	5.19 - 6.47	H 47	18.0 - 22.7
H 41	6.48 - 7.92	H 48	22.8 - 25.0
H 42	7.93 - 9.84	H 49	25.1 - 29.5
H 43	9.65 - 11.1	H 50	29.6 - 34.5

Connect incoming Line to terminals L1, L2 and L3

Connect terminals A1-A2, B1-B2, C1-C2 to corresponding terminals of the motor

4. "SECURITY" NO. 340 PRIMARY RESISTOR STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

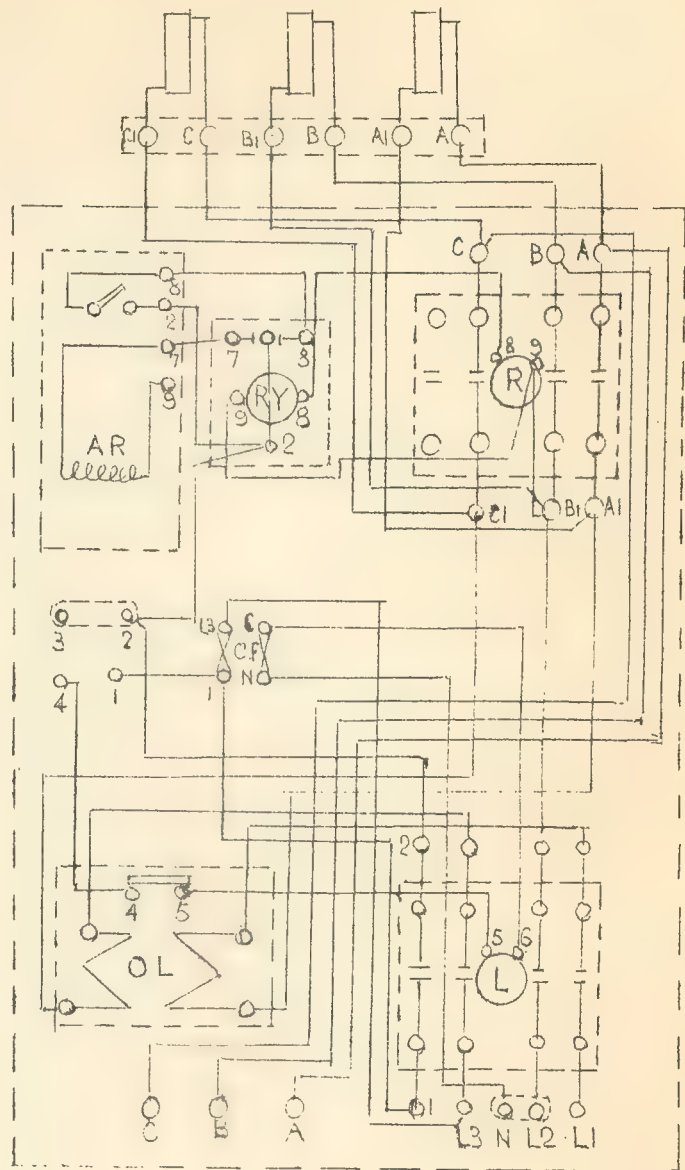
OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

A connections diagram is attached.

Resistors



Connect Line to terminals
L1, L2, L3 and Motor to
Terminals A, B, C.

CONNECTIONS FOR
№340 PRIMARY RESISTOR
STARTER

5. "SECURITY" NO. 405 SECONDARY RESISTOR STARTER.

CONTROL. This starter is suitable for 3-wire integral or remote push button or both, or by 2-wire thermostat, pressure switch or similar device. When integral push button is supplied it is connected as shown in Figure 1. If in addition a remote push button is required, it is connected as shown in Figure 4, removing link between terminals 2 and 3 on the starter panel. If the remote push button only is supplied, it is connected as shown in Figure 2. Where 2-wire control is used it is connected as in Figure 3.

It is not possible with this starter to use a 2-wire control device in conjunction with a 3-wire momentary contact push button station.

When necessary the line contactor "L" can be supplied with a coil at neutral voltage. Under these circumstances it is only necessary to change the coil, remove the bridging link between N and L2 and connect the supply neutral wire to terminal N.

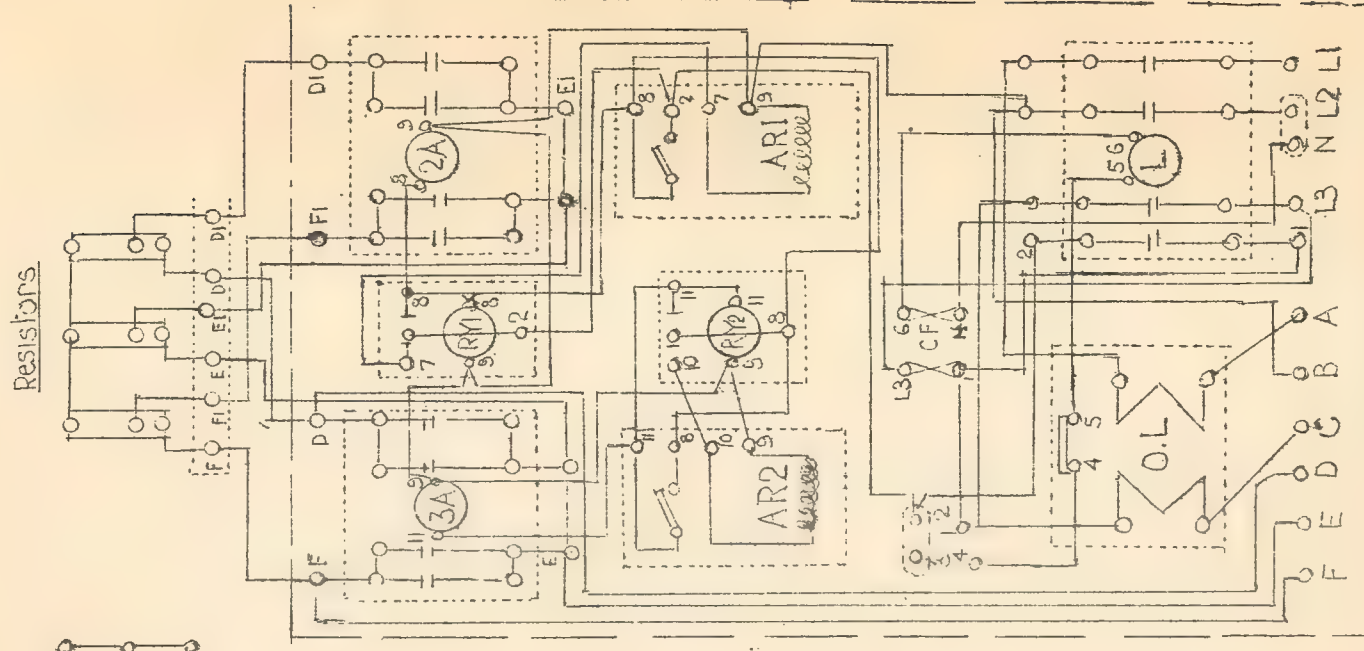
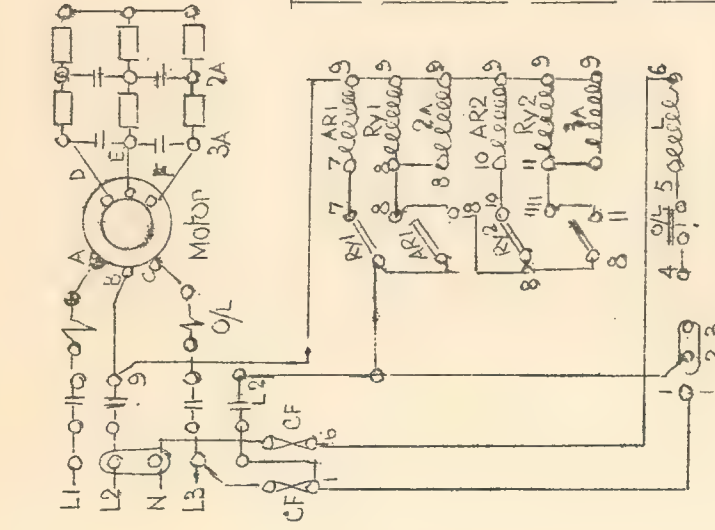
OVERLOAD PROTECTION. The starter is provided with thermal relay for motor protection and in addition must be protected by circuit fuses which should be rated not in excess of three times full load motor current. Thermal heater coils should be in accordance with the table shown on the connections diagram.

To instal heaters remove screw holding the calibration plate in position and slide moulding to its uppermost extent and withdraw. Insert heaters in cavity taking care that coils are correctly in position and ceramic or asbestos protecting tube is in place. Replace moulding and ensure that pawls correctly engage. Set pointer to the desired position on calibration plate and tighten retaining screw. The calibration plate indicates the current at which the relay will trip in an ambient of 40 degrees C. The relay should be set at a value not in excess of 10% above full load current of the motor as shown on the nameplate.

The time delay consists of a small induction disc motor which, when energised, engages through a worm gear with the timing dial causing this to rotate in an anti-clockwise direction and eventually close the control circuit to the full running contactor. The relay is adjusted at the factory to operate in approximately ten seconds but this may be varied to suit local conditions. To vary the time, slacken off the knurled screw holding the timing dial in position and move to the desired point.

A diagram of connections is attached.

CONNECTIONS FOR NO. 405 SEC. RESIS. STARTER 3 STEP.



Back of Panel Diagram

Connect Line to Terminals L1, L2, L3.

Connect Stator to terminals A, B and C
and rotor to terminals D, E, F.

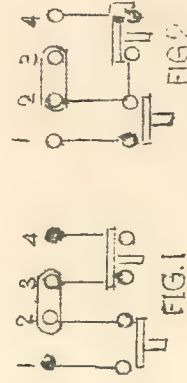
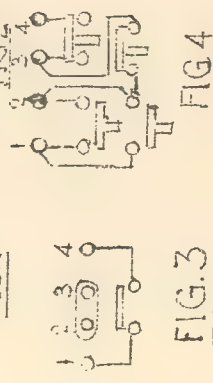


FIG. 1



315

HTR. No.	Motor Amperes	HTR No.	Motor Amperes
H37	3.16 - 3.52	H44	11.2 - 13.3
H38	3.53 - 4.13	H45	13.4 - 16.1
H39	4.64 - 5.18	H46	16.2 - 17.9
H40	5.19 - 6.47	H47	18.0 - 22.7
H41	6.48 - 7.92	H48	22.8 - 25.0
H42	7.93 - 9.84	H49	25.1 - 29.5
H43	9.85 - 11.1	H50	29.6 - 34.5

A.G.E. motor control equipment is manufactured by Australian General Electric Proprietary Limited.

Details of certain types of starters are as follows :-

1. TYPE IC. 3450-A2 MANUAL STARTING COMPENSATOR.

This type compensator starter is for use with squirrel cage motors up to 60 H.P. An illustration and connections diagram are attached.

To start. close the supply to the starter. Throw the handle quickly to the starting position and hold it there firmly for about one second to see if the motor is going to start. If the motor does not start let the handle fly back to the "off" position. If the motor does start, continue to hold the handle in the starting position until the motor ceases to accelerate, then pull the handle quickly to the running position and let go of it.

If it is a new installation and the motor fails to start or starts too slowly, move the three tap links to the next higher voltage tap. Try starting again, and if it starts slowly, connect the links to the highest voltage set of starting taps. If it starts too fast, move the leads to the lowest voltage set of starting taps.

When changing the tap connecting links be sure to tighten down the holding nuts. Always have all three links connected to the same percentage voltage tap.

If the motor will not start with the connections made to the highest voltage set of starting taps, the load is probably too great for the motor or the line voltage is low.

Standard starters are provided with taps at 60 and 80% line voltage up to 50 H.P., and at 50, 65 and 80% line volts over 50 H.P. Starters are delivered connected to the 60 or 65% tap.

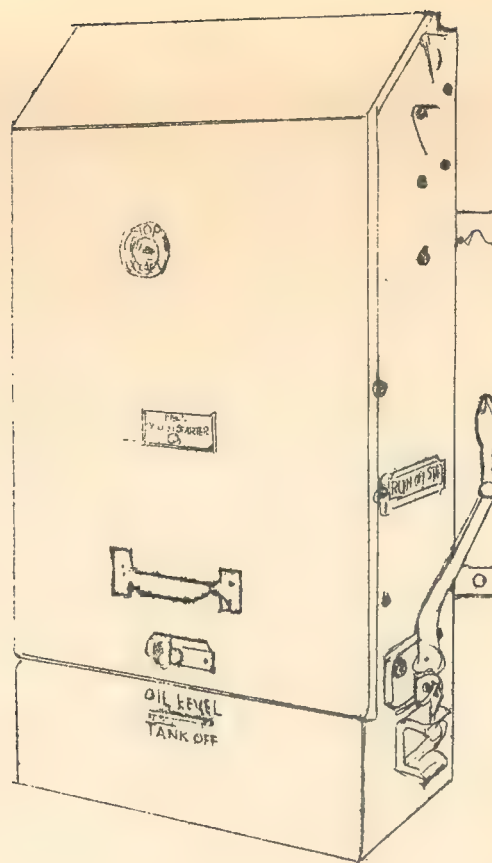
To stop. press the button on the cover.

Undervoltage Protection.

Undervoltage protection is provided by a retaining magnet which holds the switch in the running position. Upon failure of voltage, it releases the switch which is automatically returned to the "OFF" position. A second start after voltage failure must be made in the normal manner.

Overload Protection.

These starters are provided with type IC.3702 separate heater thermal overload relays. The rating of the relay heater should correspond with the ampere rating stamped on the motor nameplate.



MANUAL STARTING COMPENSATOR

Type IC 3450-A2

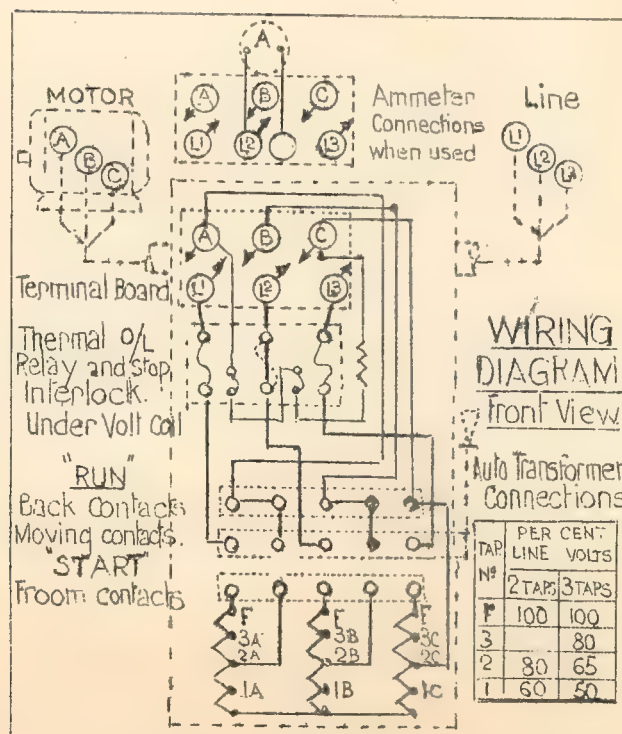


DIAGRAM OF CONNECTIONS

On the occurrence of an overload, the relay will trip, and the relay contacts must be reset by hand before the starter is again used. The relay cannot be reset until after sufficient time has elapsed for the heating elements and the motor to cool. The length of time depends on the severity of the overload but it is usually from 20 to 40 seconds. Do not attempt to start the motor again until the thermal relay has reset. The thermal relay is reset by pressing the button on the front cover.

2. TYPE IC 3415 OIL-BREAK STAR DELTA STARTER.

This type of starter is suitable for control of six-terminal three-phase squirrel cage motors up to 25 H.P.

All are provided with undervoltage protection but a large number of starters in earlier installations will be found without overload protection.

An illustration and connections diagram are attached.

To start - Move the switch handle over to the "start" position and hold it there until the motor is accelerated to a fair speed, then throw it smartly across to the run position until the extreme limit of movement is reached, and after a slight pause allow the handle to move back a short distance until it is felt to be retained by the hold-on catch.

To stop - Press the lever marked "trip" on the side of the case.

Overload Protection.

Overload protection, if fitted, is of the thermal overload type. After the relay trips, it must be reset by hand and this cannot be done until sufficient time has elapsed for the relay heating elements (and the motor) to cool, usually 20 to 40 seconds. The push button in the front cover of the starter enables the relay to be reset without opening the case.

3. TYPE IC 3402 AIR-BREAK STAR DELTA STARTER.

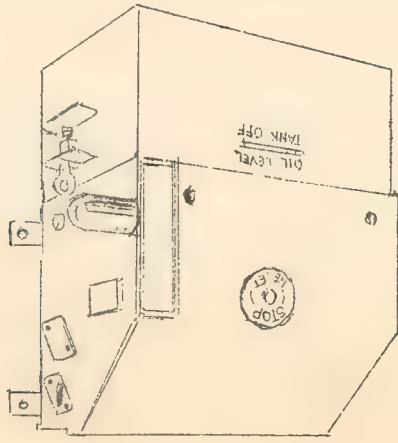
This type of starter is suitable for control of six-terminal three-phase squirrel cage motors up to 20 H.P.

All are provided with undervoltage protection but a large number of starters in earlier installations will be found without overload protection.

An illustration and connections diagram are attached.

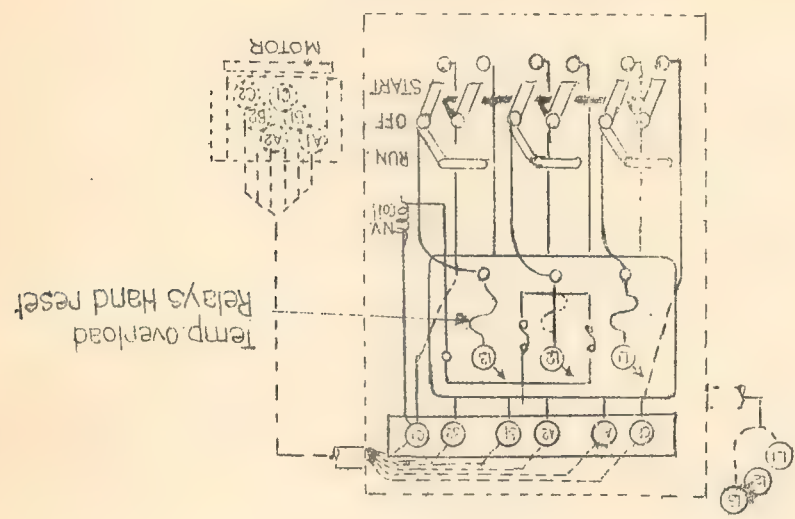
To Start - Move the handle over to the "start" position and hold it there until the motor is accelerated to a fair speed, then throw it smartly across to the "run" position until the extreme limit of movement is reached, and after a slight pause allow the handle to move back a short distance until it is felt to be retained by the hold-on catch.

OIL-BREAK STAR DELTA STARTER. For starting 3 phase squirrel cage induction Motors.



Type IC 3415

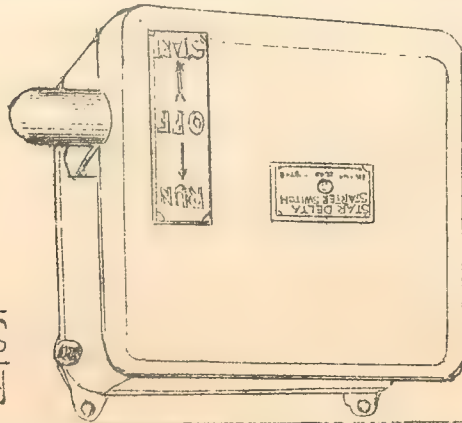
Type IC 3415 Oil-Break Starter With cover on



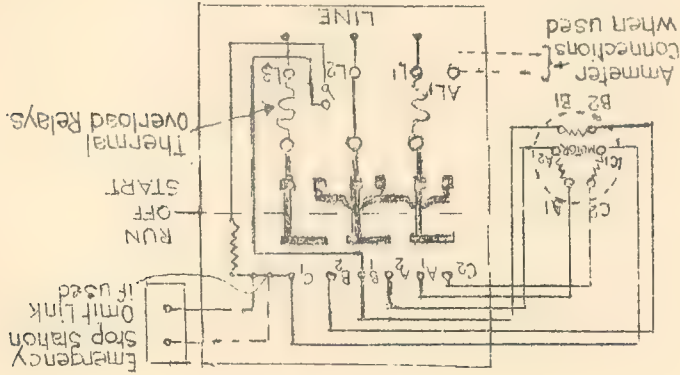
Connection diagram with 2 pole thermal overload protection (third overload shown dotted)

STAR DELTA STARTER TYPE IC 3402

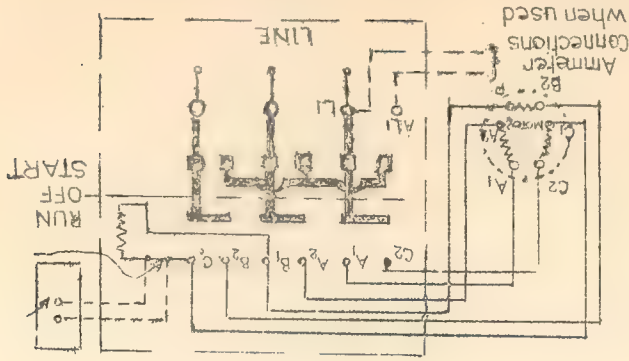
For starting 3 phase
Squirrel cage Induction Motors.



TYPE IC 3402 STARTER, WITHOUT OVERLOADS



Connection diagram including 2-pole thermal overload protection



Connection diagram without overload protection.

ITEM 25 (CONTD).

3. (Contd).

To Stop - Press the lever marked "trip" on the side of the case.

Overload Protection.

Overload protection, if fitted, is of the thermal overload type. After the relay trips it must be reset by hand and this cannot be done until sufficient time has elapsed for the relay heating elements (and the motor) to cool, usually 20 to 40 seconds. The push button in the front cover of the starter enables the relay to be reset without opening the case.

4. A.G.E. DIRECT-ON-LINE CONTACTOR STARTERS.

The A.G.E. range of magnetically-operated contactor starters are suitable for throwing squirrel cage motors directly on the line, or for use as a primary switch for wound rotor motors having secondary control.

Each consists of a triple-pole restricted blowout type magnetically operated contactor with a two or three pole hand-reset temperature overload relay mounted on a base and enclosed in a suitable case.

Overload Protection.

The overload relay is a fixed part of the switch but has interchangeable heater units. These heater units are available in various capacities and for different current ratings within the capacity of a switch. It is necessary only to change the relay heaters. Each heater unit consists of a wire or punched grid unit held in place on the relay by two screws. The heating element is connected directly in a phase of the motor circuit.

The heat from the heating element is transmitted to a thermostatic strip. On the occurrence of an overload, the heat from the element causes the thermostatic strip to deflect the rate and amount of deflection depending upon the severity and duration of the overload. The relay is so designed that the thermostatic strip will deflect far enough to trip the contact mechanism just before the overload will cause the motor to be excessively heated. The operation of any one of the relay units will trip the contact mechanism so that all phases of the motor are properly protected.

Undervoltage Protection.

The starter is ordinarily operated by means of a "start" "stop" push-button station. This station is of the momentary-contact type and an auxiliary contact is provided on the magnetic contactor to provide an electric interlock for the holding circuit. If such a push-button station is used and the voltage fails, the contactor will open and will

A.C. MAGNETIC SWITCHES

TYPES AD 30, AD 50, AD 75, AND AD 150

Wiring Diagrams for 3 Phase 3 wire Circuits.

With Overloads

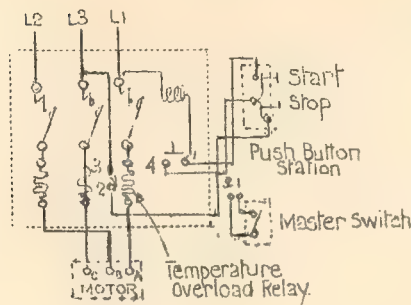


Fig 1

Without Overloads

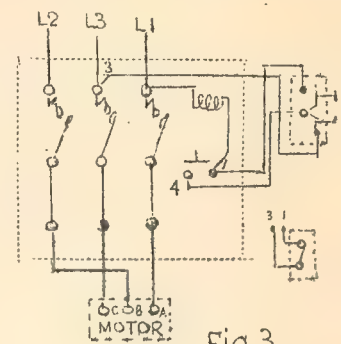


Fig 3

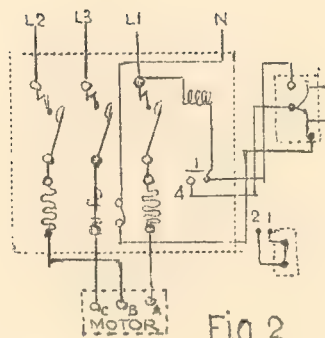


Fig 2

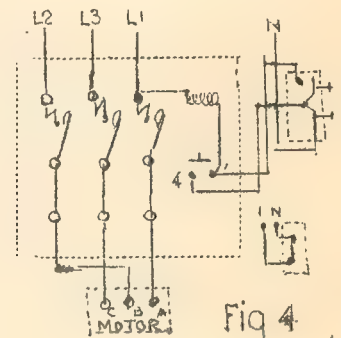


Fig 4

Fig 1 & 3 with coils connected between phases

Fig 2 & 4 with coils connected between phase and Neutral.

ITEM NO. 25 (CONTD).4. (CONTD).

not close automatically on return of voltage, but the "start" button must be pressed to restart the motor. This scheme of connections provides undervoltage protection. If desired, the switch may be controlled from a number of places simply by installing a suitable number of push-button stations.

When this switch is used to handle the primary circuit of a wound-rotor motor in connection with a secondary drum controller or faceplate type rotor starter, a "start" and "stop" push-button is not required as provision is usually made in the starter for closing the contactor coil circuit as the starter handle is turned to the first point, and to open it on returning the handle to the "OFF" position. This combination of magnetic switch and secondary starter provides undervoltage protection.

If the contactor is controlled from a maintaining-contact type push button station, pressure governor, pressure switch, float switch or similar single pole, single throw device, undervoltage release is obtained. The contactor opens on voltage failure, but recloses on return of power.

Maintenance.

The sealing surfaces on the magnet frame and the armature should be kept clean.

Do not lubricate the copper tips, as lubrication shortens the life of the tips. In general, the tips will not need attention during their normal life but if prominent copper beads form on the surface or if the tips turn a dark colour due to overheating, the contact faces should be dressed with a fine file. When tips have worn to such an extent that no rocking movement can be noticed when the starter is closed, the tips should be renewed.

Connections diagrams are attached.

5. A.G.E. AUTO-TRANSFORMER CONTACTOR STARTER.

The type IC3561 auto-transformer contactor starter (automatic starting compensator) consists of a three-phase auto-transformer with taps for supplying reduced voltage to the motor during acceleration, an accelerating contactor which connects the auto-transformer to the line and the motor to the reduced voltage taps, a line contactor, a two-element thermal overload relay and a Telechron-motor-operated transfer relay which causes the accelerating contactor to open and the line contactor to close after a definite time delay.

Control.

Built-in "Start" - "Stop" push-button station for local control, or for

remote control by separate push-button station. Operation is entirely automatic after "start" button is pressed - starting and running contactors are mechanically and electrically interlocked to assure proper sequence of operation. May be controlled automatically by float switch pressure switch, or other pilot device.

Operation.

The five pole starting contactor is first energised, connecting the auto-transformer to the line, and the motor to the taps of the auto-transformer.

Simultaneously, the definite time relay is energised. After a time interval corresponding to the setting of the relay, the accelerating contactor opens, which disconnects the transformer from both line and motors, and the run contactor closes, connecting the motor directly to the line.

6. TYPE IC3551 AUTOMATIC PRIMARY-RESISTANCE STARTER.

This type of primary-resistance contactor starter is suitable for three-phase squirrel cage motors driving fans, centrifugal pumps, line shafting and general purpose applications where low starting torque is sufficient and where the starting current must be reduced to permissible limits.

These starters are made in four sizes to control motors with maximum H.P. ratings of $12\frac{1}{2}$, 25, 50 and 100 respectively :-

Each starter consists of :-

- (a) Definite time escapement type accelerating relay mechanically actuated by the closing of the line contactor.
- (b) Two or three element thermal overload relay.
- (c) Triple-pole line contactor.
- (d) Triple-pole accelerating contactor.
- (e) Starting resistance, single step, equal parts connected in each phase.

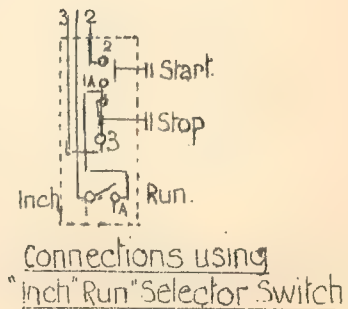
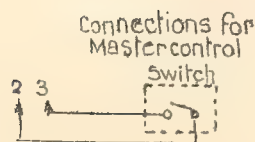
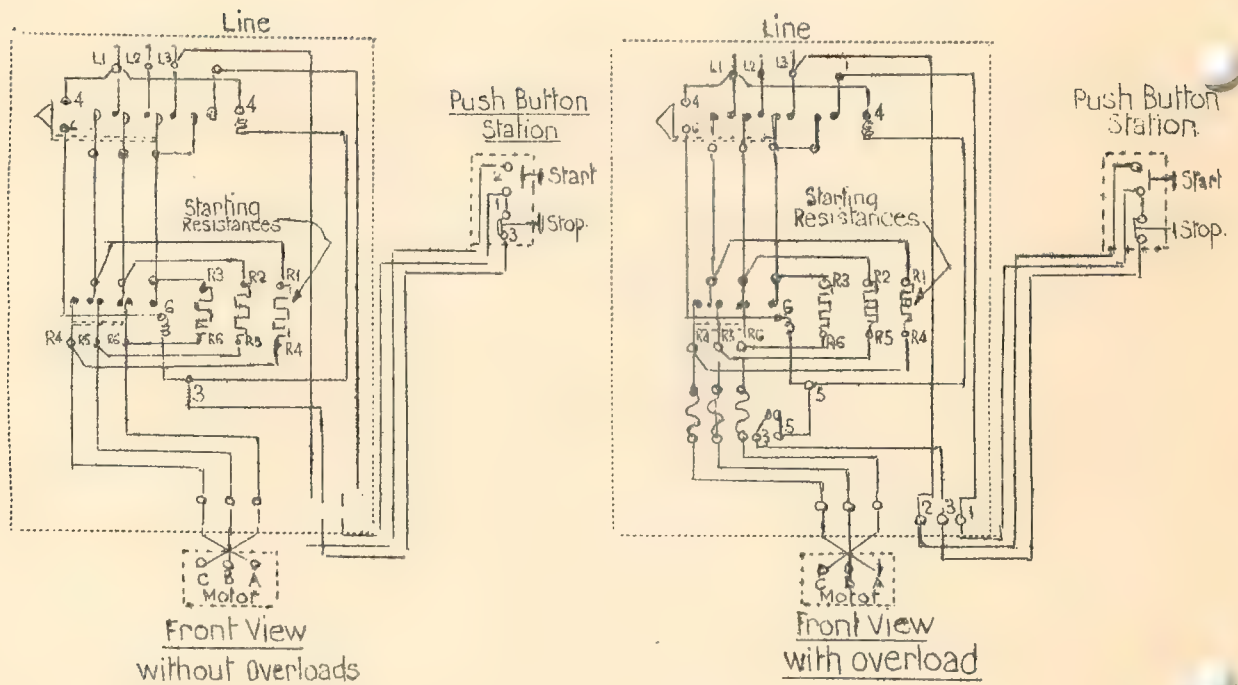
The above equipment is mounted on a compound base with the resistance supported on the back for sizes $12\frac{1}{2}$, 25 and 50 H.P., and mounted on the top of the case for the 100 H.P. size. The complete unit is enclosed in a case with removable or hinged (depending on the size of starter) front cover.

AUTOMATIC PRIMARY RESISTANCE STARTER

TYPE IC 3551

Sizes AD4, AD5, AD6 and AD7

Connection Diagram



NOTE : When Starters are used on Phase to Neutral Control
Omit connections to L1 and connect 4 to neutral.

7. SECONDARY RESISTANCE STARTERS.

The type IC3556 automatic starters are for use with wound rotor induction motors.

The size K1 panel consists of an accelerating contactor of the barrier type, an accelerating relay, temperature overload relay, and starting resistor all mounted on a compound base in an enclosing case arranged for wall mounting.

The K2 panel is similar to the K1 except that it has one more accelerating contactor and relay, and that the contactors are provided with magnetic blowouts.

The K3 panel consists of a line contactor, two or three accelerating contactors and relays, and a temperature overload relay, all mounted on compound bases for floor mounting.

Operation.

Pressing the "start" button causes the primary contactor to close, which connects the motor to the line with all resistance in the secondary circuit. A definite time (depending on the setting of the definite time interlock) after the line contactor is closed, the definite time interlock operates and causes the first accelerating contactor to close. The accelerating contactors close in sequence with time intervals until the starting resistance is all short circuited.

Starters, size K3, are arranged for all the accelerating contactors except the last one to be de-energised in the running position. Thus the magnetising current is required only for the line contactor and the final accelerating contactor.

Pressing the "stop" button de-energises the line contactor, which disconnects the motor from the line.

Overload Protection.

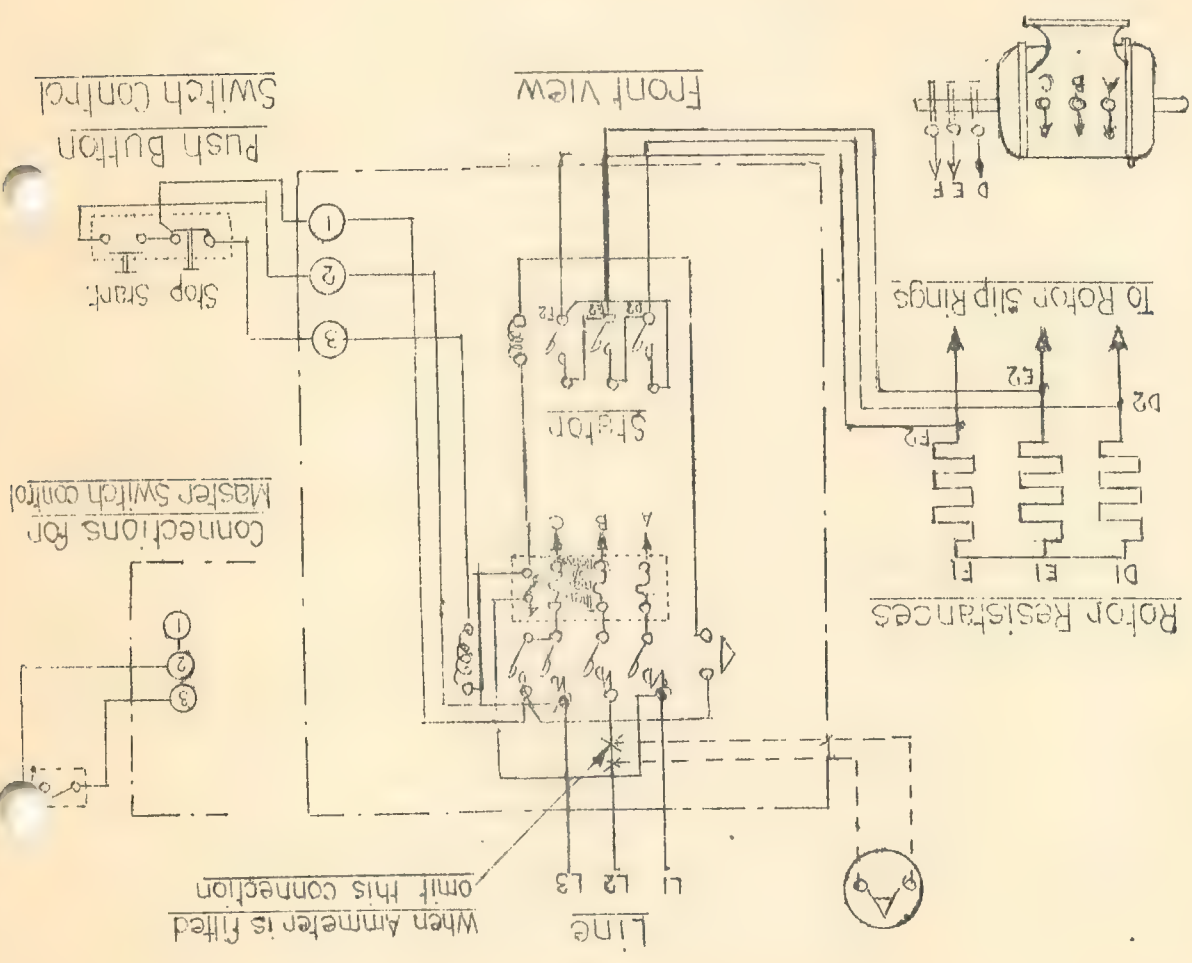
Overload protection is provided by either a two or three pole temperature overload relay. After the relay trips, its contacts must be reset by hand. The relay cannot be reset until after sufficient time has elapsed for the heating elements (and the motor) to cool.

Undervoltage Protection.

If the panel is controlled from a momentary contact push-button station, the equipment shuts down after return of power until the "start" button is again pressed.

A.G.E. SECONDARY RESISTANCE STARTERS

Type L.C.3556-A1



NOTE When used in Phase to Neutral control remove connection to L1 & connect 4 to Neutral

6 (CONTD).

Reduced voltage starting is obtained by means of the voltage drop across the starting resistance, equal parts of which are connected in each phase. As the motor accelerates, the current taken decreases and consequently the voltage drop across the resistance decreases and the voltage at the motor terminals rises. Thus, the torque developed by the motor builds up as the speed increases.

The motor circuit is not interrupted during starting, but the resistance is simply short-circuited after a definite time, determined by an adjustable definite-time mechanical interlock. Consequently, the motor does not lose speed during transfer from reduced voltage to full voltage and acceleration is smooth.

Start. Started and stopped by means of a push-button station built in to the starter for local control or separately for remote control. Operation is entirely automatic after the "Start" button is pressed - starting and running contactors are interlocked to assure proper sequence of operation. Operation can be made completely automatic by using a maintaining-contact pilot control device such as a float switch.

Over-load Protection.

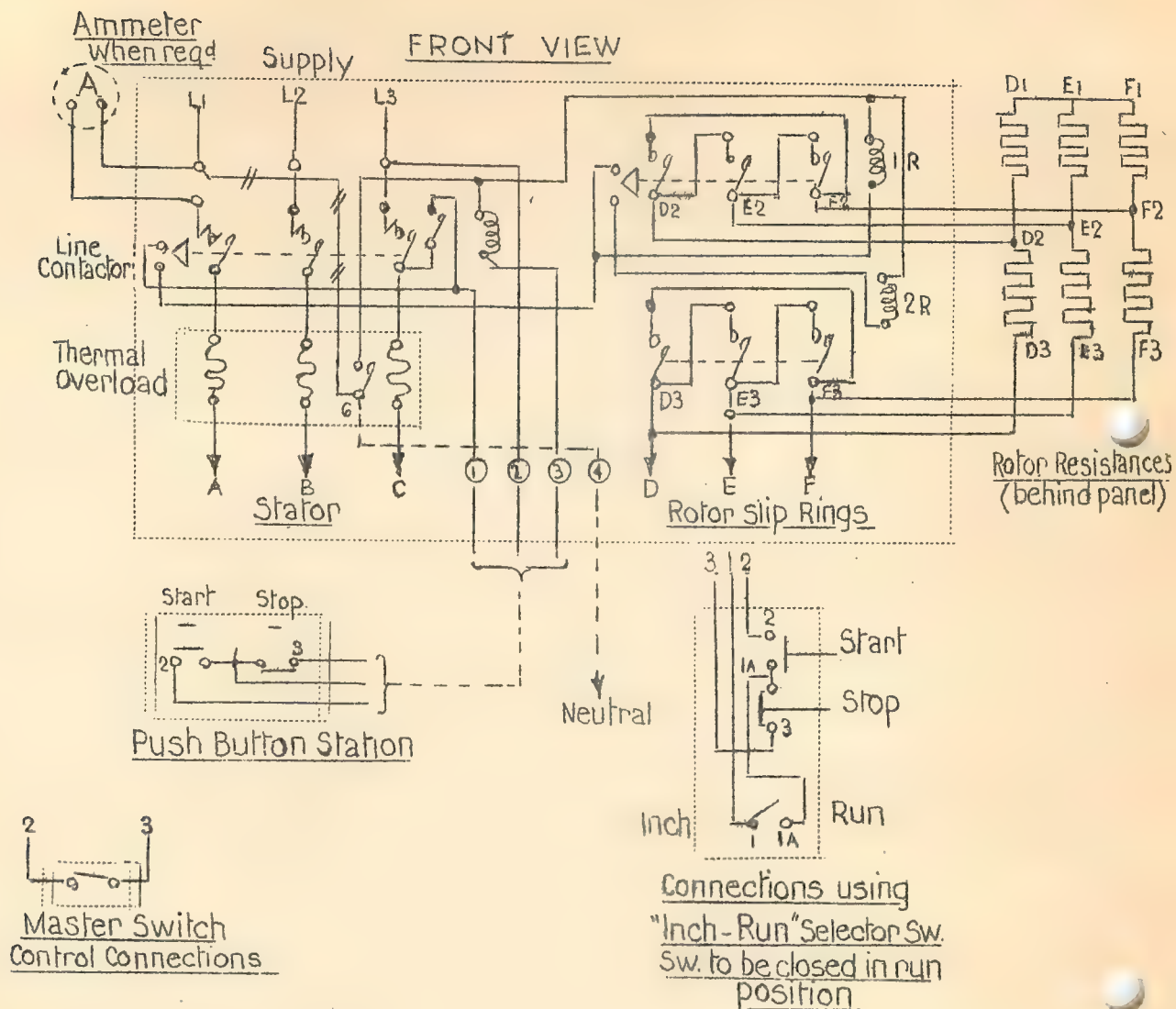
Relays are of the hand reset thermal overcurrent latched type. Tripping of the relay is effected by the deflection of a bi-metallic strip which is indirectly heated and the heaters can readily be changed to alter the capacity of the relay without upsetting the calibration.

Definite Time Acceleration.

Definite time acceleration is obtained by the use of a definite time interlock, giving a time delay of one-fifth seconds between the closing of the line contactor and the accelerating contactor.

The interlock consists of an escapement, a lever for attaching to the contactor shaft and a set of contacts. When the line contactor closes, the spring is compressed. This applies torque to the gears through the ratchet. The escapement measures a definite time and after the gears have rotated, the ratchet is released and the contacts are closed, with a snap action. This energises the second contactor, cutting out the starting resistance. The time period may be adjusted to suit the load requirements.

A connections diagram is attached.



For phase to neutral control, omit connection L1 to 6 and connect 6 to 4 to Neutral

WIRING DIAGRAM - Type 1C3556 K.2

SECONDARY RESISTANCE STARTER

ITEM NO. 25 (CONTD).

ELECTRIC MOTORS.

7 (CONTD).

If it is controlled from a pressure governor, pressure switch, float switch or similar sustained contact type of switch, the contactors open on voltage failure but automatically re-accelerate the motor on the return of power.

Time Limit Acceleration.

The accelerating relay consists of a pendulum type definite-time interlock giving a time delay of 1 to 7.5 seconds between accelerating steps. The interlock consists of an escapement similar to that used in clocks.

The time period is adjusted by turning the adjusting nuts to either lengthen or shorten the pendulum.

A wiring diagram is attached.

8. REVERSING MAGNETIC SWITCH.

The type IC3513-A1 reversing magnetic switch consists of two modified triple pole direct-on-line contactor starters mechanically interlocked on two separate moulded bases and enclosed in a welded wall mounting sheet steel case with lift off cover.

Overload protection is provided by means of two or three pole thermal relays.

Wiring diagram is attached.

The type IC 3513-A2 reversing, magnetic switch consists of two triple pole, mechanically interlocked, magnetically operated contactors with restricted type blow-outs, and with a normally open interlock on each contactor and with two or three hand reset thermal overload relays. The contactors and thermal overload relays are the same as used in the direct-on-line contactor starter.

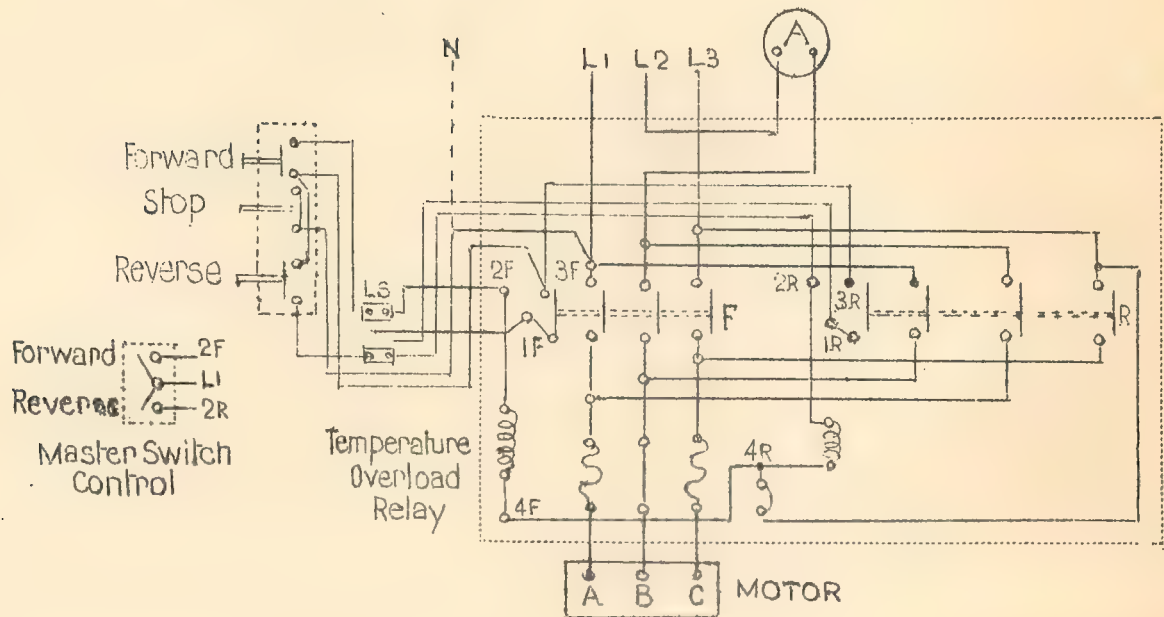
A.C. REVERSING MAGNETIC SWITCH

7½ H.P. Max.

TYPE IC 3513 A1

400-550 Volts

For use with Squirrel Cage or Slip Ring Induction Motors



NOTE :- (a) When Limit Switches are not connected, connect 1F to 2F and 1R to 2R.

(b) For Phase to Neutral Operation, connect 5 to Neutral and omit connection to L1.

Wiring Diagram

SECTION NO.10.

S E R V I C E F U S E S .

- ITEM NO. 1 Fuse Terminology.
- " 2 Standard Arrangement of Service Fuses.
- " 3 Standardising.
- " 4 Inspection of Fuse-Links and Neutral Link.
- " 5 Locations of Stocks of Fuses and Fuse-Links.
- " 6 Repair or Replacement of Defective Service Fuses.
- " 7 Disposal of Defective Fuses.
- " 8 Reporting Defects.
- " 9 Replacement of 70 amp. Service Cabinets.
- " 10 Overloaded Service Fuses.
- " 11 Connections to Load Side of Fuses Where Wires
Should be Soldered into Lugs.
- " 12 Service Fuses Erected on Verandah Plates or
Barge Boards.
- " 13 Service Fuse-Links and Neutral Links Left at
Disconnected Service's.
- " 14 Spare Fuse Links at Customers' Premises.
- " 15 Service Cartridge Fuses.
15.1 Contact Surfaces.
15.2 Fibre Stops.
15.3 Insertion of Fuse-Links and Links -
Safety Precautions.
15.4 50 amp and 100 amp Service Cartridge Fuses.
15.5 200 amp and 300 amp Service Cartridge Fuses.
15.6 600 amp Service Cartridge Fuses.
- " 16 Identification of S.C.C. Standard Service Cartridge
Fuses, Fuse-Links and Links.
- " 17 Types of S.C.C. Non-Standard Service Fuses.
17.1 Original S.C.C. Types.
17.2 Service Fuses in Balmain Area.
17.3 Service Fuses in Bankstown Area.
17.4 Service Fuses in Hornsby Area.
17.5 Service Fuses in Sutherland Area.
- " 18 Bushings and Packings Required to Accommodate
Standard Fuse Links in Non-Standard Service
Fuses.
- " 19 Replacement of Service Neutral Fuses or
Links.
19.1 Multi-Core Services.
19.2 Single Phase Services.
19.3 "M" Type 55 amp Neutral Link.
- " 20 Service Fuses Displayed at Magdala Road
Depot.
- " 21 S.C.C. Ceramic Bridge Service Fuses.
- " 22 100/400 amp S.C.C. Service Cabinets.

SECTION NO. 10.

SERVICE FUSES.

ITEM NO. 1 - FUSE TERMINOLOGY.

1. Definitions.

(a) Fuse.

A device for the purpose of protecting a circuit against damage from an excessive current flowing in it by opening the circuit on the melting of a fuse-element by such excessive current. The fuse comprises all the parts that form the complete device.

(b) Fuse-Element.

That part of a fuse which is designed to melt and thus open a circuit.

(c) Semi-Enclosed fuse.

A fuse in which the fuse element is neither in free air (apart from any external containing case not forming part of the fuse) nor totally enclosed.

(d) Cartridge-Fuse.

A fuse in which the fuse-element is totally enclosed in a cartridge.

(e) Cartridge.

A totally-enclosing fuse-element container consisting of insulating material, generally tubular in form and having its ends enclosed (by metallic caps or otherwise) provided that the term "totally-enclosing" is deemed not to exclude the use of devices in connection with indicating or pressure-release.

(f) Fuse-Link.

That part of a fuse which comprises a fuse-element and a cartridge or other container, if any, and either is capable of being attached to fuse-contacts or is fitted with fuse-contacts as an integral part of it.

(g) Fuse-Contact.

A contact suitable for engaging with a fixed contact and capable of having a fuse-link attached to it, or of forming an integral part of a fuse-link.

(h) Fuse-Link Contact. (Tag).

A contact forming an integral part of a cartridge fuse-link and capable of being a fuse-contact or of being attached to a fuse-contact.

(i) Fuse-Carrier.

A removable holder serving to carry a fuse-link and fitted with fuse-contacts if necessary for this purpose. A cartridge or other container of a fuse-element, if suitable, may form a fuse-carrier or part of a fuse carrier.

(j) Fixed Contact.

A contact suitable for engaging with a fuse-contact and connected to a fixed terminal.

(k) Fuse-Base.

That part of a fuse which carries the fixed contacts.

(l) Fuse-Box.

The metal casing in which all other parts of the fuse are contained.

(m) Minimum Fusing-Current.

The minimum current at which a fuse-element in a fuse will melt.

(n) Current-Rating. (Of a fuse).

A current less than the minimum fusing-current that the fuse will carry continuously without deterioration.

(o) Size. (Of a fuse).

The maximum current-rating (expressed in amperes) that it may have, the appropriate fuse-link having been fitted.

(p) Switch-Fuse.

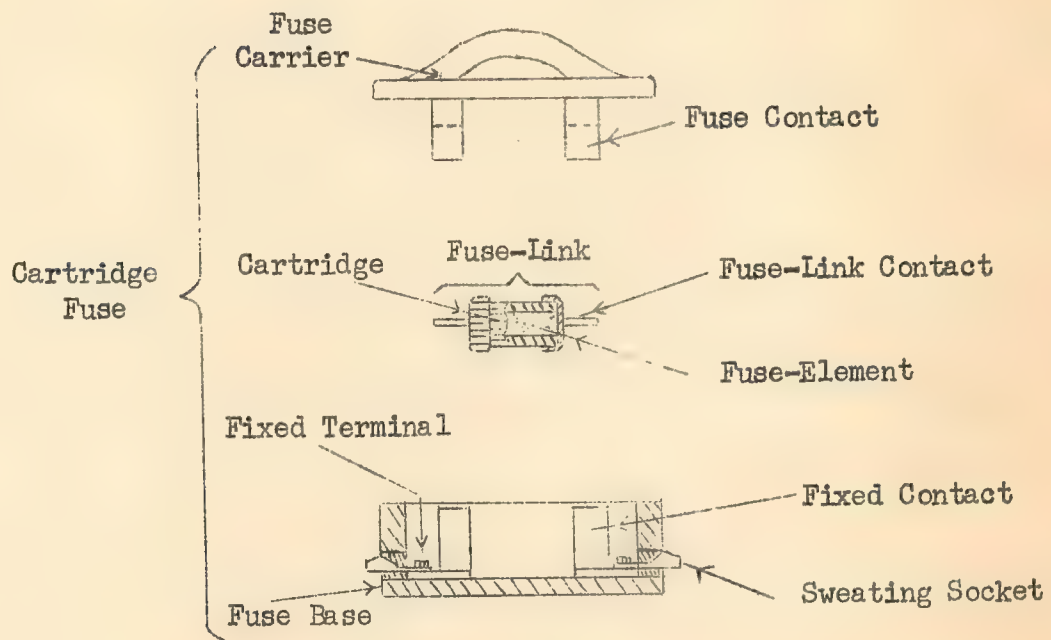
A switch, the moving part of which carries one or more fuse links.

(q) Switch and Fuse.

Indicates that switch and fuses are enclosed in the same case.

2. Component Parts of a Fuse.

The term "fuse" as applied to a protective device is by definition to be taken as applying to a device as a whole and not to any of its individual parts (a fuse-link, for example, is often but wrongly called a "fuse").



The illustration shows the component parts of a cartridge fuse (typical). In a semi-enclosed fuse the fuse-link usually becomes merely the fuse-element, namely a piece of wire.

It is very important that constituent parts of a fuse (e.g. the asbestos tube of a semi-enclosed fuse) shall not be omitted in service.

ITEM NO.2 - STANDARD ARRANGEMENT OF SERVICE FUSES.(a) Alternating Current.

Since 1st April, 1947, service fuses have been placed on service boards in the following order:-

Left to right facing the fuses,

4 core	-	N, A, B, C.
3 core	-	N, A, B or N, A, C or N, B, C.
2 core	-	N, A or N, B or N, C.

Officers should keep in mind that a number of service boards will be found with the old arrangement of A, N, B, C.

The position of the Neutral must be checked in all cases before connection, disconnection or other work is carried out on service fuses.

(b) Direct Current.

3 core	-	Positive, Neutral, Negative.
2 core	-	Positive, Neutral or Neutral, Negative.

ITEM NO.3 - STANDARDISING.

When a non-standard fuse requires renewal or its fuse-element is found blown, all fuses of the service shall be standardised. If such action would inconvenience the customer or otherwise would not be practicable at the time of visit, the Emergency Service Officer shall make an appointment with the customer for the work to be done and report details to the Despatch Officer.

ITEM NO.4 - INSPECTION OF FUSE-LINKS AND NEUTRAL LINK.

When attending service fuses, all fuse-links and neutral link must be inspected for possible adjustment or renewal.

ITEM NO.5 - LOCATIONS OF STOCKS OF FUSES AND FUSE-LINKS.

Stocks of standard fuses and fuse-links of all ratings are available at the Emergency Service Officer's City Depot.

Stocks of "A" type fuses only and standard fuse-links of all ratings are available at suburban Emergency Service Officers' Depots.

600 amp. fuse-links are available at the Emergency Service Officers' City Depot only.

Stocks of non-standard fuses and fuse-links are available at Emergency Service Officers' Depots in areas in which they may be required.

Standard cartridge fuse-links of all ratings are carried in Emergency Service Officer's vehicles.

ITEM NO.6 - REPAIR OR REPLACEMENT OF DEFECTIVE SERVICE FUSES.

Where possible, repair or replacement of service fuses on overhead services shall be carried out by Emergency Service Officers.

The soldering of lugs on the line side of overhead services and all work associated with the repair or replacement of service fuses connected to underground mains is the responsibility of the Mains Branch.

Soldering of lugs on the load side of overhead services will be carried out by the Installation Inspection Branch.

When the repair or replacement of service fuses is a matter of urgency, Despatch Officers must arrange for prompt attention by an Emergency Service Officer or by the staff of the Mains Branch or Installation Inspection Branch.

ITEM NO.7 - DISPOSAL OF DEFECTIVE FUSES.

Defective fuses or parts of fuses removed from customer's premises shall be deposited in boxes provided at each Emergency Service Officers' Depot.

ITEM NO.8 - REPORTING DEFECTS.

If defective service fuses or service cabinets cannot be made good with the spare parts usually carried, officers shall report the following details :-

- (a) Make of fuse or type of cabinet.
- (b) Whether of cartridge or ceramic bridge type.
- (c) Ampere rating.
- (d) Number of fuses affected.
- (e) Whether underground or overhead service.
- (f) If connections are soldered into lugs.
- (g) If fuses are in a dangerous condition.
- (h) If an appointment is necessary for replacement.

If after effecting temporary repairs, it is considered that the fuses are in a dangerous condition or the reliability of supply is likely to be affected, the Despatch Officer shall be notified immediately.

ITEM NO.9 - REPLACEMENT OF 70 AMP. SERVICE CABINETS.

Replacement of service cabinets shall be dealt with in the same manner as that of service fuses.

If the time of appointment for repair or replacement of non-standard service fuses is outside of general working hours, Despatch Officers must arrange with the Senior Emergency Service Officer for the delivery of the required fuses.

ITEM NO.10 - OVERLOADED SERVICE FUSES.

When it is reasonable to believe that service fuses are being subjected to continual overloading, Emergency Service Officers will examine the customer's installation and estimate the loading of all apparatus normally used at any one time. If the customer's installation can safely carry the estimated loading, the existing service fuses will be replaced, where possible, with a standard service fuse-link of sufficient rating to carry the required loading.

Except for 200 ampere or 300 ampere service fuses which are to be linked, if a standard fuse-link of a higher rating cannot be fitted into the service fuses, a new standard service fuse of the existing rating shall be bridged with 22 gauge tinned copper wire threaded through asbestos braiding. Sufficient strands of 22 gauge wire, in accordance with the Schedule given in Item No.21 of this Section, shall be used so that the service fuse-link together with the bridge, will be of sufficient rating to carry the estimated loading.

When Emergency Service Officers have increased the rating of service fuses, the facts, together with details of the estimated loading, must be shown on a Service Report.

Record Cards concerning overloaded Service fuses shall be forwarded to the Chief Installation Inspector who will measure the loading and advise the Mains Service Officer.

ITEM NO.11 - CONNECTIONS TO LOAD SIDE OF FUSES WHERE WIRES SHOULD BE SOLDERED INTO LUGS.

Emergency Service Officers shall report all cases where:-

- (a) Connecting leads are twisted together and placed under contact nut.
- (b) Some leads are soldered into a lug and others are placed in the same fuse either between the lug and the fuse-link or between the fuse-link and contact nut, the whole being secured by the contact nut which is provided to ensure contact between the lug and the fuse-link.

They will not report cases where wires are soldered into more than one lug placed on the same contact stud of a service fuse.

When reporting cases where wires require to be soldered into lugs, the make of the fuse must be shown so that a supply of suitable lugs may be taken to the premises when the second visit is made. The designation or name of the manufacturer of the fuse does not necessarily indicate the make of the fuse.

When disconnection is found to have been made by cutting away wires from fuses instead of removing the leads from the terminals of the energy meters or maximum demand indicators, the facts shall be shown on Service Reports.

Service Fuses.

7.

ITEM NO.12 - SERVICE FUSES ERECTED ON VERANDAH PLATES OR BARGE BOARDS.

12.1 Fuses on Verandah Plate and Service Board.

When service fuses are found on a verandah plate or barge board in addition to fuses on the service board, the fuse on the service board shall be fitted with a fuse-link of the appropriate normal rating, and the fuse-link in the fuse on the verandah plate or barge board shall be loaded so as to form a bridge.

12.2 Fuses Only on Verandah Plate or Barge Board.

Services found with fuses only on the verandah plate or barge board (none on service board) shall have the fuses fitted with fuse-links of normal rating.

Details of both cases shall be recorded on a Service Report for the information of the Mains Service Officer/Statistical Clerk (M.S.O/Stat.Cl.)

ITEM NO.13 - SERVICE FUSE-LINKS AND NEUTRAL LINKS LEFT AT DISCONNECTED SERVICES.

Service fuse-links of each type and rating except the 600 ampere type, which are stored at Depots, are carried in motor vehicles used by officers of the System Operation Branch.

When required, service fuse-links in good order shall be left at customers' premises for the connection or reconnection of the electric supply by officers of other Branches not usually carrying service fuse-links.

Service fuse-links left for insertion in disconnected service fuses will be sealed either to the outside of the appropriate fuses or to some portion of the property of the Sydney County Council at or near the service fuses. They shall be secured so that the sealing wire must be broken before the fuse-link can be detached from its temporary location.

Unused good service fuse-links securely sealed shall be left usually in the following cases:-

- (a) Disconnected vacant premises.
- (b) Disconnections for default of account.
- (c) Disconnections for repairs.
- (d) New installations but not connected.

Unless otherwise instructed, neutral service links associated with disconnected electric supply shall be left connected and sealed.

ITEM NO.14 - SPARE FUSE-LINKS AT CUSTOMERS' PREMISES.

By special arrangement, spare service fuse-links are left for replacement of defective fuses by customers' own electricians in emergency at the following premises:-

- (a) Some hospitals, theatres, public halls and buildings containing passenger lifts.
- (b) Where water pumping is necessary for fire fighting.
- (c) Where pumping is necessary to prevent damage by flooding.
- (d) Where the electric supply is necessary for some special purpose.

The spare fuse-links are sealed to, or in the vicinity of the service fuses.

A label, marked "Spare S.C.C. fuses - to be used only by licensed electrician in emergency - report use to S.C.C." is attached to the fuse-links.

When a spare fuse-link has been used by a customer's electrician, an Emergency Service Officer will be despatched to check the service fuses, replace the spare fuse-link and seal as above.

Unless otherwise instructed, officers will not leave spare fuse-links at customers' premises.

Service Fuses.

9.

ITEM NO.15 - SERVICE CARTRIDGE FUSES.

15.1 Contact Surfaces.

Officers attending service fuses will clean contact surfaces of fuses and links, contact nuts, and lugs.

Wherever possible the contacts of fuse-links or links shall be placed in direct contact with lugs on the top and bottom terminals of the service fuses. Usually this can be done with overhead services and occasionally with underground services.

Nuts must not be placed between the fuse-link contacts and the lugs.

Attention is drawn to the position of the contacts of 300 ampere "E" type fuse-links. The contacts have been placed off centre to enable the fuse-link to be kept off the ceramic base of the fuse. Insertion of the fuse-link in a wrong manner will result in a broken base.

Care must be exercised in tightening contact nuts in all fuses, otherwise the ceramic base of the fuse is liable to be broken.

Spring washers found in service fuses must be removed as they are frequently the cause of high resistance contacts.

15.2 Fibre Stops.

Fibre stops fitted to the covers of "A" type fuses which are provided to prevent fuse-links from falling out of the friction contacts of service fuses or service cabinets, must be replaced when missing.

15.3 Insertion of Fuse-Links and Links - Safety Precautions.

Rubber gloves and fuse-link inserters are issued for use when inserting service fuse-links and when carrying out work on fuses if there is a danger of making contact with energised connections.

15.4 50 Amp. and 100 Amp. Service Cartridge Fuses.

If it is not possible to renew defective service cartridge fuse-links of 50 or 100 ampere rating, bridge the defective cartridge fuse-element by using the appropriate number of strands of 22 gauge wire placed in a piece of asbestos braiding as set out in Item No.21 concerning ceramic bridge service fuses.

The action shall be shown on Service Reports.

15.5 200 Amp. and 300 Amp. Service Cartridge Fuses.

When inspection of one fuse of 200 ampere or 300 ampere rating is necessary, all other fuses must be examined and every effort made to ascertain the cause of any open-circuited fuses.

When fibre cartridge fuse-links of 200 ampere or 300 ampere rating are blown, all the service fuse-links shall be renewed whether blown or not.

In cases where ceramic cartridge fuse-links of 200 amp. or 300 amp. rating are blown, only the blown fuses shall be renewed. Emergency Service Officers shall report the number of fuse-links blown in all cases.

If it is not possible to renew 200 amp. or 300 amp. fuse-links, and supply is required immediately, suitable links shall be used.

The use of links shall be a temporary measure only.

After restoration of supply, an appointment shall be made with the customer for the earliest convenient time at which supply may be interrupted for further work on the service fuses.

When making the appointment with the customer, officers will use the phrase, "Supply has been restored but it is necessary to do some further work on the Sydney County Council's fuses", and they shall state the approximate period of the interruption necessary for the performance of the further work.

Where further work is necessary, the Despatch Officer must be notified as soon as possible of the rating and make of fuse, details of the work to be done and the time of the appointment.

15.6.600 Amp. Service Cartridge Fuses.

600 ampere Type "G" service fuse-links and links are not included in vehicle equipment but adequate stocks are provided at the Emergency Service Officers' City Depot.

When 600 ampere fuse-links are defective and supply is required immediately, restore supply by using two (2) 300 ampere Type "E" links. Place two (2) links end to end and join together with a copper connection piece provided for use with "Ajax" 300 ampere fuses, using $\frac{1}{2}$ " brass bolt and nut.

The use of the composite link shall be a temporary measure only.

In cases where a composite link has been used, an appointment for "Further Work" shall be made and the Despatch Officer shall be advised as soon as possible.

Further action to be taken shall be the same as that set down for 200 amp. and 300 amp. service fuses.

Service Fuses.

11.

ITEM NO.16 - IDENTIFICATION OF S.C.C. STANDARD SERVICE CARTRIDGE FUSES,
FUSE-LINKS AND LINKS.

Amps. rat- ing	SERVICE FUSES		FUSE-LINK	SERVICE LINKS	
	Formerly known as	New Desig- nation		Formerly known as	New Desig- nation
25 50	John Pratt	Fuse "A" 70 amps.	70 HRC	John Pratt Neutral link	Link "A" 50 amps.
50	Workshop type 50 amps.	Fuse "B" 50 amps.	60 TBC (if possible) or 50 "B"	50 amps.neutral link, Workshop type.	Link "B" 50 amps.
50	E.D. Standard 50 amps.	Fuse "C" 100 amps.	100 HRC	50 amps.neutral link	Link "C" 100 amps.
100	E.D.Standard, 100 amps. Workshop type 100 amps.	Fuse "C" 100 amps.	100 HRC	100 amps. Neutral link	Link "C" 100 amps.
200	E.D.Standard 200 amps.	Fuse "D" 200 amps.	E.A.M. or 231 T.F.	200 amps. Neutral link	Link "D" 200 amps.
300	E.D. Standard 300 amps.	Fuse "E" 300 amps.	232 T.K.	300 amps. Neutral link	Link "E" 300 amps.
				300 amps.Ajax & B.I.neutral link.	Link "F" 300 amps.
600	E.D.Standard 600 amps.	Fuse "G" 600 amps.	600 "G"	600 amps. Neutral link	Link "G" 600 amps.

ITEM NO.17 - TYPES OF S.C.C. NON-STANDARD SERVICE FUSES.17.1 Original S.C.C. Types.

The types of metal clad fuses installed by the Council in areas prior to the inclusion of Sutherland, Bankstown, Hornsby and Balmain are as follows:-

(a) Fuses Equipped With Cartridge Fuse-Links

NAME	ABBREVIATION
LAWRENCE & HANSON	L. & H.
AJAX	AJAX
BRITISH INSULATED	B.I.
BRITISH GENERAL ELECTRIC	B.G.E.
B.W. ELECTRIC	B.W.
ELECTRICITY DEPARTMENT - OLD DESIGN	E.D. OLD DESIGN

The various makes as shown in No.1 Photograph attached to Item No.20. See also Item No.18 for details of bushings and packings required to accommodate standard fuse-links.

(b) Fuses Equipped With Porcelain Fuse Carriers.

The various makes are shown in No.2 Photograph attached to Item No.20. These fuses are now regarded as obsolete but are allowed to remain in service if in good condition and of the required current rating. Replacements when necessary, are made from stocks of standard fuses.

17.2 Service Fuses in Balmain Area.

Metal-clad service fuses installed in the Balmain Area prior to transfer to Sydney County Council.

AMPERES RATING	FUSE		FUSE-LINK		
	MAKE	REF. No.	AMPS.	TYPE	REF. No.
30	HENLEY			P.B.	
60	HENLEY			P.B.	
200	HENLEY	30204	100/160	HRC	30006
200	HENLEY	30204	200/300	HRC	30009
300	HENLEY	30205	350/500	HRC	30632
Fuse-links 30006 and 30009 have 3" centres.					
Fuse-link 30632 has 3½" centres.					

17.3 Service Fuses in Bankstown Area.

Porcelain bridge type service fuses installed in the Bankstown Area prior to transfer to Sydney County Council.

AMPERES RATING	FUSE	
	MAKE	REF. NO.
15	ISCO	1015
30	ISCO	1030
60	ISCO	1060
30	B & H	BACK CONNECTED
30	B & H	FRONT CONNECTED
100	FEDERAL	-

60 amp. HRC, type T.I.S. and 100 amp. H.R.C., type T.C.P. fuse links may be found mounted on S.C.C. switchboard panels above awnings e.g. in Bankstown main shopping centre.

Spare fuse-links are held in Emergency Service Officer's Stores Locker at Eldridge Road.

17.4 Service Fuses in Hornsby Area.

Types of Service Fuses installed in Hornsby Area prior to transfer to Sydney County Council.

(a) Metal-Clad Type.

AMPERES RATING	FUSE		FUSE-LINK		
	MAKE	REF. NO.	AMPS	TYPE	REF. NO.
30	HENLEY			P.B.	
60	HENLEY			P.B.	
200	HENLEY	30204	100/160	HRC	30006
200	HENLEY	30204	200/300	HRC	30009
300	HENLEY	30205	350/500	HRC	30632
Fuse-links 30006 and 30009 have 3" centres. Fuse-link 30632 has 3 $\frac{1}{4}$ " centres.					

SERVICE FUSES.

(b) Porcelain Bridge Type.

AMPERES RATING	FUSES	
	MAKE	REF. NO.
15	ISCO	1015
30	ISCO	1030
60	ISCO	1060
30	B & H	BACK CONNECTED
60	B & H	FRONT CONNECTED
100	FEDERAL	-

17.5 Service Fuses in Sutherland Area.

Porcelain bridge type service fuses installed in Sutherland Area prior to transfer to Sydney County Council.

AMPERES RATING	FUSES	
	MAKE	REF. NO.
15	ISCO	1015
30	ISCO	1030
60	ISCO	1060
30	B & H	BACK CONNECTED
60	B & H	FRONT CONNECTED
100	FEDERAL	-

ITEM NO.18 - BUSHINGS AND PACKINGS REQUIRED TO ACCOMMODATE STANDARD FUSE LINKS IN NON-STANDARD SERVICE FUSES.

Make of fuse	Rating of fuse	Service fuse-link		Bushing reqd.	REMARKS
		Letter	Rating		
LAWRENCE & HANSON (L. & H.)	25	B	50	5/8" dia. x 3/16" th.	Place 1/4" dia. standard brass washer under each contact wing nut.
	50	B	50		
	50	B	50	5/8" dia. x 3/16" th.	
	100	C	100	7/8" dia. x 3/16" th.	Replace wing nuts with 3/8" Whit. hex brass nuts.
	200	E	300	1 1/4" dia. x 1/2" th.	Place 1/2" dia. Standard brass washer under each contact nut.
	300	E	300	1 1/4" dia. x 1/2" th.	Place 1/2" dia. Standard brass washer under each contact nut.
AJAX	25	B	50		Cut corners off each contact blade of fuse-link on same side.
	50	B	50		
	100	C	100		
	200	E	300		Place 1/2" dia. standard brass washer under each contact nut.
	300	E	300	Copper extension	See attached diagram of bushings and connection piece

BUSHINGS AND PACKINGS REQUIRED TO ACCOMMODATE STANDARD FUSE-LINKS IN
NON-STANDARD SERVICE FUSES (CONT'D).

Make of fuse	Rating of fuse	Service fuse-link		Bushing reqd.	REMARKS
		Letter	Rating		
British Insulated (B.I.)	25	B	50	5/8" dia. x 3/16" th.	
	50	B	50	5/8" dia. x 3/16" th.	
	100	C	100		
	200	E	300		Where necessary alter centres of contact studs 3/8" one end by drilling base of fuse.
	300	E	300		Alter centres of con- tact studs 1-1/16" one end by drilling base of fuse.
	ø See footnote.				

ø Remove wood screws securing load side porcelain base of fuse, insert service fuse-link and restore supply, then drill cast iron base of fuse and insert wood screws.

British General Electric (B.G.E.)	25	B	50		Cut sufficient length off both contact blades of fuse-link to fit in jaws of fuse between cable lugs.
	50	B	50	Close contact jaws and wind 22 G. wire over half the length of lower contact blade of fuse so as to pre- vent fuse-link slipping out of top jaw of fuse.	
	100	C	100		
	200	E	300	Use only 300 amp. service fuse-link with 1/4" thickness contact blade ø See footnote.	
	300				No particulars available.

ø Place 4 twisted strands of 22 G. wire through hole in one contact blade of fuse-link and insert fuse-link in fuse with wire resting on bottom jaw, bend wire over either side of jaw so as to prevent any movement of wire and fuse-link slipping down from top jaw of fuse.

BUSHINGS AND PACKINGS REQUIRED TO ACCOMMODATE STANDARD FUSE-LINKS IN
NON-STANDARD SERVICE FUSES (CONT'D).

Make of fuse	Rating of fuse	Service fuse-link		Bushing reqd.	REMARKS.
		Letter	Rating		
B.W. Electric Co. (B.W.)	25	B	50	Special screw & Bushing	Open hole in contact blade of fuse-link to accommodate 5/16" dia. contact studs. No particulars available. No particulars available
	50	B	50		
	100				
	200	D	200		
	300				
Electricity Dept. Old Design	25	B	50	5/8" dia x 3/16" th.	No particulars available.
	50	C	50		
	100	C	50		
	200	D	200		
	300				
Sydney County Council Standard (Std.)	25	A	50		Usually mounted on marble panel.
	50	C	50		
	100	C	100		
	200	D	200		
	300	E	300		
	600	G	600		
Stocks of 600 amp. fuse-links kept at City Depot.					

ITEM NO.19 - REPLACEMENT OF SERVICE NEUTRAL FUSES OR LINKS.19.1 MULTI-CORE SERVICES.

Neutral service fuses or old type neutral bridges (cartridge fuse-links bridged by copper bar on outside) found by Emergency Service Officers on all except single phase services shall be replaced immediately by the appropriate type neutral link where circumstances permit.

If it is not practicable for the Emergency Service Officer to install the appropriate link at the time of his visit, the neutral fuse shall be strengthened by bridging with strands of 22 gauge fuse wire and the job referred to the Despatch Officer for the link to be installed between 9.00 a.m. and 5.00 p.m. next general working day or at the earliest time suitable to the customer.

Attention required on bunched neutrals as in blocks of flats, etc., shall be referred to the Installation Inspection Branch or if on an underground service, to the Mains Branch.

19.2 SINGLE PHASE SERVICES.

Emergency Service Officers are not required to replace neutral fuses on single phase services (or to report them for attention) unless a fault exists somewhere in the neutral fuse box or connection.

19.3 "M" TYPE 55 AMPERE NEUTRAL LINK.

Since 1949, "M" type 55 ampere neutral links have been used instead of the old "A" type 50 ampere neutral links.

The "M" type neutral link consists of a brass terminal block in a bakelite case with brass sealing clip.

All new 70 ampere services and all 70 ampere service boards which are being altered will have "A" type service fuse boxes for the active conductor fuse-links and an "M" type neutral link for connections of all neutral conductors.

Where Emergency Service Officers have occasion to install neutral links on 70 ampere services to replace either -

- (a) Fuse-links installed in the neutral boxes
- or (b) faulty "A" type neutral links, bases or fuse boxes,

the type of neutral link to be installed shall be "M" type. The cover shall be sealed on to prevent unauthorised removal.

Stocks of "M" type neutral links are provided in all Depot stores lockers and in all vehicles.

ITEM NO.20 - SERVICE FUSES DISPLAYED AT MAGDALA ROAD DEPOT.

Types of service fuses are mounted on boards and displayed at Magdala Road Depot.

Service Fuses of the cartridge fuse type are shown in the accompanying Photograph No. 1.

The Fuses in each column (top to bottom) are identified as follows:-

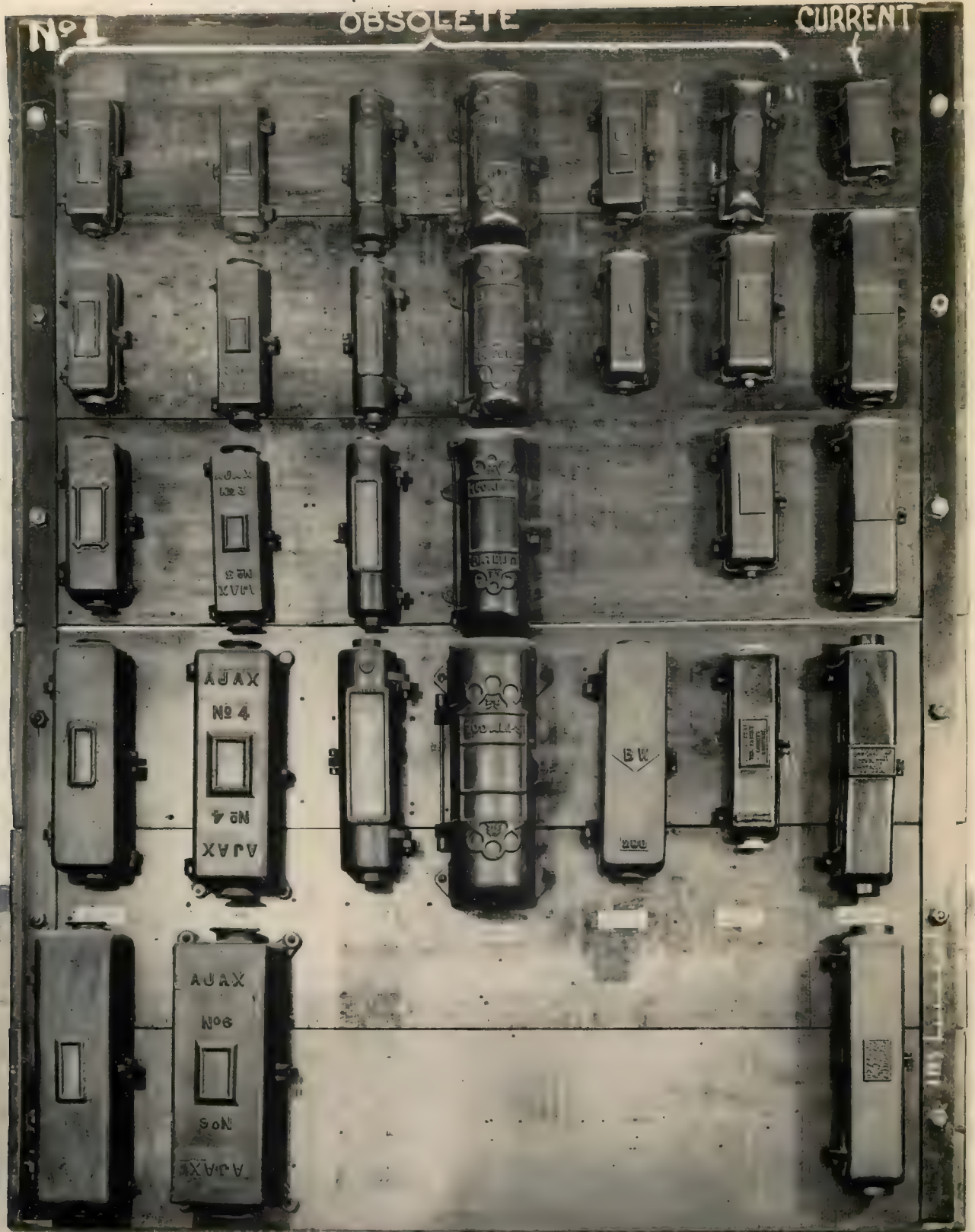
First Column:	Lawrence & Hanson	(L.&H.)
Second Column:	Ajax	(Ajax)
Third Column:	British Insulated	(B.I.)
Fourth Column:	British General Electric	(B.G.E.)
Fifth Column:	B.W. Electric	(B.W.)
Sixth Column:	Electricity Dept.	(E.D. Old Design)
Seventh Column:	S.C.C. Standard	(S.C.C. Std.)

Service fuses fitted with bridge type ceramic fuse carriers are shown in Photograph No.2.

Nº 1

OBsolete

CURRENT





CERAMIC BRIDGE SERVICE FUSES.

21.1 General

The types of ceramic bridge fuses originally installed by the Sydney County Council differ only in minor details of design although made by various manufacturers. It is therefore unnecessary to set them out in schedule form.

Usually they are of 25 ampere rating; a very small number of the larger ratings are in existence.

Service fuses fitted with bridge type ceramic fuse carriers are shown in Photograph No.2 as attachment to Item No. 20.

21.2 Fuse Links

Ceramic bridge service fuse carriers shall be re-wired with 30 or 22 S.W.G. tinned copper wire placed in asbestos braiding as set out in the following schedule:-

Rating of fuse - amperes	Size of wire	Number of Strands
8	30.S.W.G. or 0.0124 dia.	1
10	" "	2
15	" "	3
20	" "	4
25	22.S.W.G. or 0.029 dia.	1
40	" "	2
55	" "	3
75	" "	4
100	" "	6
200	" "	12
240	" "	18

When the number of strands is twelve or more and if space on the ceramic bridge permits, distribute the strands in separate lengths of asbestos braiding in the order of 3 and 4 so as to prevent overheating.

Service FusesITEM NO. 21 (CONT'D)21.3 Adjustment of Defects

When contacts have become annealed through overheating but sufficient contact can be obtained after cleaning the contacts, or when fuses are mounted on the wall of a weatherboard house and vibration is likely to cause a ceramic bridge carrier to fall out of the fixed contacts, pass a piece of 22 gauge fuse wire behind the base of the fuse and tie it round the ceramic bridge.

When the contacts of a ceramic bridge have been damaged beyond temporary repair and the defective part cannot be replaced at the time of visit, secure the fuse wire to the line and load sides of the fuse and report the fuse for replacement.

21.4 Adjustment of Contacts

Service fuses fitted with ceramic bridge fuse carriers depend upon the carrier being held in position by pressure exerted between the fixed contacts fitted to the ceramic bridges.

Examination of defective fuses recovered from customers' premises has revealed that in some cases the defect originated from incorrect adjustment of the contact surfaces.

ITEM NO.22 - 100/400 AMP. S.C.C. SERVICE CABINETS

H.R.C. fuse links for use in 100/400 S.C.C. service cabinets.

AMPERES RATING	REFERENCE
100	D
100	TC
200	TF
200	TA
200	Y200VB
300	EB
400	EBS

CUSTOMERS' CONTROL AND PROTECTIVE EQUIPMENT

Item No. 1 Methods of Dealing with Customers' Defective Control Gear

- 1.1 General
- 1.2 Circumstances In Which Various Types of Switchgear may be Bridged.
- 1.3 Maintaining Supply by Substitution and Duplication.
- 1.4 Method of Distinguishing Between Various Types of Overload Earth Leakage Circuit Breakers.
- 1.5 Action to be Taken in Extreme Circumstances.
- 1.6 Switch-Fuse Temporarily Loaned to Customers.
- 1.7 "Further Work" Card to be Left.
- 1.8 Disconnections.
- 1.9 Defective Equipment Where There is no Access to the Premises.
- 1.10 Reconnection of New Switchgear.

Item No. 2 Protection of Electric Installations Against Earth Leakage.

- 2.1 General
- 2.2 Installation and Connection of Earth Leakage Circuit Breakers.
- 2.3 Earth Leakage Circuit Breaker Used for Relay Operation.
- 2.4 Protection of Separately Metered Parts of an Installation by One Circuit Breaker.
- 2.5 Use of Earth Leakage Circuit Breakers as Main Switches.
- 2.6 Selective Protection.
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SECTION NO. 11
CUSTOMERS' CONTROL AND PROTECTIVE EQUIPMENT

ITEM NO. 1 - METHODS OF DEALING WITH CUSTOMERS' DEFECTIVE CONTROL GEAR

1.1 General

When an Emergency Service Officer finds that the cause of interruption in the supply to a customer's installation is the failure of a customer's control or protective gear, it may, in certain circumstances, be permissible for him to bridge out the defective gear. The essential point to be kept in mind when determining whether the equipment should be bridged out is:-

Even with the defective equipment bridged, it must still be possible to readily disconnect all circuits from the switchboard either by operating the main switch or switches or by withdrawing the fuses. On small installations where unit type switchgear is frequently used, i.e. switchgear having the main switch and the circuit fuses in one case, or overload circuit breakers or overload earth leakage circuit breakers, bridging out this gear would make it impossible to readily disconnect any circuit. Therefore, such gear should not be bridged except in extreme circumstances (See 1.5).

Definition of Bridging:

In this instruction "Bridging" shall mean:-

Connecting incoming and outgoing conductors to a common terminal;

OR

Shunting the defective equipment by connecting a suitable cable between the terminals to which the incoming and outgoing cables are connected;

OR

Connecting the incoming and outgoing conductors together independent of the defective equipment.

"Bridging" as used in this instruction must not be confused with the temporary bridging adopted when a cartridge fuse has operated and strands of fine wire are connected between the ferrules on the end of the cartridge or between the contacts in which these ferrules are gripped.

1.2 Circumstances in Which Various Types of Switchgear may be Bridged.

(a) Main Switch

When a non-automatic main switch is defective it is permissible to bridge it without making any test.

Control and Protection

1.2 (Cont'd.)

(b) Fuses

Fuses should not be bridged under normal circumstances. See item 1.5 (Action to be taken in extreme circumstances).

Where practicable, a temporary repair may be made to the defective fuse. If this is not possible, a temporary fuse element of appropriate size sheathed with asbestos sleeving may be installed pending permanent repairs by contractor.

(c) Switch Fuses

Where the switch-fuse is the only control and protective device in the circuit, it must not be bridged except in extreme circumstances unless the switch mechanism can be bridged leaving fuse wedge protection capable of being withdrawn. (See 1.5). But where there is, between the Council's service fuses and the defective switch-fuse, a main switch, the defective switch-fuse may be treated in the same manner as the defective fuse (see 1.2 (b)). Where there is a fuse between the defective switch-fuse and the circuit wiring, the defective switchgear may be treated in the same manner as the defective switch (see 1.2 (a)).

(d) Overload Circuit Breakers

As an overload circuit breaker performs a function similar to that of a switch-fuse, the same instruction covers the bridging of defective overload circuit breakers as covers the bridging of defective switch-fuses (see (c) above).

(e) Earth Leakage Circuit Breakers

When the earth leakage circuit breaker is defective, an earth test shall be made with test lamps. Although this does not prove that the conduits are effectively earthed, the earth leakage circuit breaker may be bridged and supply left connected in the following circumstances:-

- (a) The insulation of the wiring is sound, and
- (b) Adequate fuse or other protection remains in service, or
- (c) Suitable substitute protection can be provided.

If these circumstances do not apply, supply shall be disconnected.

"Whether supply is left connected under the conditions set out above or disconnected, the job shall be referred to the E.I.S."

(f) Combined Overload Earth Leakage Circuit Breakers

When an overload earth leakage circuit breaker is defective and the test fuse does not melt when the test is applied, and although this could indicate that the conduits are not effectively earthed, the overload earth leakage circuit breaker may be bridged and supply left connected subject to (a), (b) and (c) of clause (e) "Earth Leakage Circuit Breakers".

provided that adequate fuse protection is provided. See - 1.7 - Action to be Taken in Extreme Circumstances.

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1.3 - Method of Using Test Fuses.

Where a test fuse is mentioned in this instruction the following shall be meant:-

A fuse wired with a fuse element of one strand 32 S.W.G. copper wire shall be connected between the active and the F terminal of the earth leakage circuit breaker (K terminal on German circuit breakers) OR between the active and the conduits if there is no earth leakage circuit breaker or if the F (or K) terminal cannot be located OR between the active and the earth wire connected to the water main if there is no earth leakage circuit breaker and no conduits exist.

These connections to the fuse will, of course, be made with the main switch or sub-main switch open. If, when that switch is closed, the fuse element does not melt, the switch must be opened again immediately, the connections checked and another trial made. In no case should the switch be left closed if the fuse element does not melt.

1.4 - Maintaining Supply by Substitution and Duplication.

Instead of bridging out defective switchboard equipment it is frequently possible to maintain supply to a circuit by connecting the circuit conductors to spare fuses or overload circuit breakers. If this is possible and not much work is involved, the Emergency Service Officer may make the change.

Alternatively, it may be possible to connect the circuit previously supplied through the defective switchboard equipment to other adjacent equipment which controls another circuit, i.e. to use one set of fuses to protect two circuits. This paralleling of circuits may be done only when-

- (a) It will not involve much time.
- (b) The customer urgently requires supply to be maintained.

It must not be done where it would be necessary, because of the load, to unduly increase the size of the fuse element in the undamaged equipment.

When such an alteration has been made the customer should be told that two circuits are temporarily supplied through the one equipment and that it will be necessary for the number of appliances connected at one time to the two circuits to be limited to the number normally connected from one of the circuits.

Where, in accordance with the method described above, the load side connections from an earth leakage circuit breaker have been connected temporarily to an adjacent earth leakage circuit breaker, it is necessary also to transfer to that circuit breaker the conductors connected to the E and F terminals (or in the case of A.E.G. earth leakage circuit breakers, the conductors connected to the H and K terminals). Such a transfer of E and F wires would necessitate so much work in the case of Westinghouse earth leakage circuit breakers that this method of maintaining supply should not be attempted when one of these circuit breakers is defective.

1.4 (CONT'D)

"Thielsboards" and "Thielsbrakrs" are generally of the type providing protection for two circuits in the one housing. Therefore, if tests show that the cause of a failure is an open circuit in the internal connections of one side of a "Thielsboard" or "Thielsbrakr", it is permissible for an Emergency Service Officer to connect the circuit previously supplied from the side which has become defective to the other side of the breaker. Here again the customer should be told that the number of appliances connected to the circuit breaker should be restricted to the number usually supplied from one of the circuits.

1.5 - Methods of Distinguishing Between Various Types of Overload Earth Leakage Circuit Breakers.

It is necessary for a different procedure to be adopted in dealing with defective earth leakage circuit breakers and defective overload circuit breakers. It is therefore essential that officers be able to distinguish the different types of circuit breakers.

Except for a few early German models the only overload circuit breakers in use at present in the average domestic or commercial installation are Westinghouse and T. & H. (Thielsbrakrs). These are similar in appearance to the earth leakage circuit breakers made by the same manufacturers but have no test buttons.

The combined overload earth leakage circuit breakers can be distinguished from the earth leakage circuit breakers in the case of Westinghouse by the use of a blue or green test button on the combined unit and a red test button on the earth leakage circuit breaker.

The overload earth leakage circuit breaker manufactured by T. & H. is called and marked a Thielsboard. The earth leakage circuit breaker is called and marked a Thiels-switch and the overload breaker is called and marked a Thielsbrakr.

1.6 - Testing Earth Leakage Circuit Breakers.

When working on a switchboard to which an earth leakage circuit breaker is connected Emergency Service Officers should always operate the testing button on the circuit breaker. If the circuit breaker operates this will indicate that the circuit breaker and the earthing connection to it are in good condition. If the circuit breaker does not operate from the test button it should be operated manually to ascertain if the mechanism is in working condition. The test fuse will then be applied between active and the conduits or, if no conduits exist, to the earthing conductor connected to the water main.

If the earth leakage circuit breaker does not operate from the test button but operates when this test fuse is applied, supply will be left connected and the case reported for the information of the Chief Installation Inspector to follow up.

If the earth leakage circuit breaker does not operate and the test fuse element does not melt, the circuit breaker will be treated as defective and either the supply will be disconnected, circuit breaker will be bridged out, or action will be taken according to the merits of the case as set out under the heading "Switch-fuse temporarily loaned to customers."

Master earth leakage circuit breakers which control more than one customer's installation, such as in a block of flats, will not be tested for tripping.

When an Emergency Service Officer discovers a case where an earth leakage circuit breaker has operated to isolate a defect, or has operated for a cause not ascertained, or its operation has caused other earth leakage circuit breakers to open unnecessarily, he will report the occurrence in as full detail as possible.

Earth leakage circuit breakers are referred to in Item No.2 of this Section.

1.7 - Action To Be Taken in Extreme Circumstances.

When the switchboard at customers' premises has been damaged and when it is required that supply be immediately restored to some essential apparatus such as fire pumps, water pumping, hospitals, or equipment used in an important continuous process, the Emergency Service Officer may connect the apparatus or installation direct to the Sydney County Council fuses. It must be understood that this is only to be carried out in extreme circumstances and the Emergency Service Officer must satisfy himself that the customer has arranged for a temporary switchboard to be installed within a few hours. If it is not possible for the customer to replace the switchboard within a few hours the Emergency Service Officer shall arrange to connect temporarily one of the switch-fuses which are stored at Emergency Service Officers' Depots (See No.8 below).

In cases where Emergency Service Officers have connected customer's installation or apparatus direct to S.C.C. fuses, the 11-7 Despatch Officer will, upon receipt of the Emergency Service Officer's report, check to ascertain whether a second visit was made to the customer's premises to connect new or repaired switchgear. If a second visit was not made a Record Card will be made out and the installation inspected as soon as possible to ascertain if repairs have been effected. If repairs have not been carried out the installation or apparatus will be disconnected or a switch-fuse loaned to the customer, depending upon the circumstances.

1.8 - Switch-Fuse Temporarily Loaned To Customer.

Where it is not permissible to bridge out defective apparatus at customer's switchboard and it is an urgent necessity that the supply be restored to the premises, a switch-fuse may be loaned to the customer pending repairs or replacement of his own apparatus.

NOTE: A switch-fuse may be used to temporarily replace a defective overload earth leakage circuit breaker or overload circuit breaker but where it replaces an overload earth leakage circuit breaker the test fuse test must first be carried out. In all cases the switch-fuse must, of course, be earthed.

Loan of the Sydney County Council's switch-fuse will be made only if -

The customer is unable to obtain the services of an electrical contractor, or the electrical contractor is unable to obtain apparatus to restore the supply, and the installation belongs to -

- (a) An industrial customer,
- (b) A commercial customer,
- (c) A domestic customer with an all electric home,
- (d) A domestic customer in whose premises there is serious sickness

Two 30 ampere triple pole "Standard" switch-fuses and one 20 ampere double pole "B. & H." switch-fuse are stored at each Emergency Service Depot. In addition, each Emergency Service Officer is issued with one 20 ampere "B. & H." switch-fuse.

Although the 20 ampere switch-fuses are rated at 240 volts, these may be used on 2 phase 3 wire installations as a temporary expedient provided that only 240 volt circuits are connected to the switchgear. As an example, if a domestic customer has a range connected to one phase and the lighting and general purpose outlets connected to the other phase, one pole may be used for supplying the range and the other for the light and power, the neutrals being connected solidly. The loading so connected must not exceed the rating of the switch-fuse.

The range may be found supplied by two phases and the lighting and general purpose outlets connected to one or both phases. If the connections at the switchboard permit of re-arrangement and the neutral conductor is large enough, portion or whole of the range can be connected to one pole of the switch-fuse and portion or whole of the lighting and general purpose outlets can be connected to the other pole, thus using both phases.

A variety of connections can be made, but in no case should the switch-fuse be overloaded, having regard to the diversities etc. permitted by the Wiring Rules.

The 20 ampere switch-fuse will not in any circumstances be used to supply a 415 volt circuit with 415 volt appliances and it must not be used on direct current installations.

In cases where the essential load to be connected exceeds the rating of the 20 ampere switch-fuse, the 30 ampere metal clad switch-fuse will be installed.

If the required loading is greater than 30 amperes but does not exceed 60 amperes, the 30 ampere cartridge fuse may be replaced by a standard S.C.C. "B" type fuse with the contact blades removed, or by a standard "A" type fuse with the sides of the contacts removed.

Each of the switch-fuses will be provided with a notice which will carry the Sydney County Council's serial number and the following information:-

"Switch-Fuse

The Property of The Sydney County Council

On loan only to the occupier of the premises."

Each switch-fuse, before being placed in stock, will have attached to it an "Undertaking to Pay" form made out in the following manner:-

"I hereby request The Sydney County Council to loan me a switch-fuse for seven (7) days. I agree to return the switch-fuse to The Sydney County Council in good order and condition or, if the switch-fuse is damaged or lost, to pay to the Council the cost incurred by the Council, as certified by the General Manager of the Council, of repairing or replacing the switch-fuse. I agree to make that payment within three (3) weeks after the receipt by me of an account for such amount from the Council. I also hereby acknowledge receipt of the switch-fuse.

Dated this _____ day of _____ 19____.

SIGNATURE: _____

Address to which account is to be forwarded:

_____".

When an Emergency Service Officer discovers circumstances in which, in accordance with the foregoing, a switch-fuse should be loaned to the customer, the following procedure will be carried out:-

- (a) The Emergency Service Officer will obtain the signature and address of the customer on the "Undertaking to Pay" form attached to the switch-fuse. He will then erect and connect the switch-fuse.

Should it be necessary to obtain a switch-fuse from an Emergency Service Depot, the Emergency Service Officer will contact the Despatch Officer who may decide to forward the switch-fuse to him by another officer if by so doing time would be saved.

- (b) The Emergency Service Officer will leave a "Further work" card instructing the customer to have defective switchgear, etc. repaired or replaced within seven (7) days.

- (c) The Emergency Service Officer will forward the signed "Undertaking to Pay" form to the Emergency Service Room attached to his report for the particular job.

In all cases where a switch-fuse is loaned to a customer, the serial number of the switch-fuse must be entered on the Service Report.

When an Emergency Service Officer installs a 20 ampere switch-fuse on loan, he will obtain a replacement from the Emergency Service Depot and record on the Service Report the serial number of the replacement switch-fuse as well as that of the switch-fuse loaned to the customer.

- (d) A Record Card is provided for each switch-fuse and kept in the Emergency Service Room.
- (e) The Chief Installation Inspector will arrange for the recovery of switch-fuses loaned to customers and for their return to the Emergency Service Supervisor, except when an Emergency Service Officer visits premises for the purpose of reconnecting supply and finds a switch-fuse loaned by the Council disconnected for return. The Emergency Service Officer shall notify the Despatch Officer that a switch-fuse has been recovered and return it to the appropriate Depot. The Emergency Service Officer shall record on his report form the serial number of the switch and the Depot to which it is returned.

1.9 - "Further Work" Card to be left.

Whenever, in accordance with this instruction, equipment has been bridged or duplicate connections have been made, a "Further Work" card must be left with the customer endorsed ".....to be repaired or replaced within seven (7) days."

Record Cards concerning these cases shall be referred to the Chief Installation Inspector.

1.10 - Disconnections.

Wherever, in accordance with this instruction, it is not found possible to bridge out defective equipment and the circumstances are not such that equipment should be loaned to the customer, then the supply to the defective equipment and the circuit or circuits supplied from it shall be disconnected.

1.11 - Defective Equipment where there is no access to the Premises.

Where defective control or protective equipment is discovered and no access to the premises can be gained, supply shall be disconnected and no further action taken. A "No Access" card shall be left on the premises and the Despatch Officer informed of the circumstances without delay.

1.12 - Reconnection of New Switchgear.

If an electrical contractor or customer telephones the Emergency Service Section and advises that new switchgear has been installed,

Control and Protection.1.12 - (CONT'D).

connected and set to work, the information shall be telephoned to the Supervisor, Installation Inspectors if received during office hours. Confirmation of the particulars received shall be forwarded to the Chief Installation Inspector's Branch on a Record Card.

If an Electrical Contractor requests disconnection of the electricity supply to permit the connection of replacement switchgear, the Emergency Service Officer shall, after disconnecting the electricity supply, remain at the premises until the replacement switchgear is connected, unless this is going to take excessive time, when an appointment will be made. He shall then test the gear and check the earthing system. If the test is satisfactory the electricity supply shall be left connected. A Record Card with details shall be forwarded to the Chief Installation Inspector's Branch.

When switchgear is stolen the procedure will be the same as set out above.

ITEM NO.2 - PROTECTION OF ELECTRIC INSTALLATIONS AGAINST EARTH LEAKAGE.

2.1 - General.

Electric installations which, in accordance with the S.A.A. Wiring Rules must be earthed, will be approved for connection to the mains of the Council only if each installation is protected against faults to earth as under:-

(i) In the Area Supplied Through Overhead Mains and Overhead Service Wires.

By an earth leakage circuit breaker or breakers complying with the Approval and Test Specification No.C.110(issued by the Standards Association of Australia) and installed in accordance with the appropriate requirements of the S.A.A. Wiring Rules.

(ii) In the Area Supplied Through Underground Cables.

By bonding the main earthing conductor of the installation to a special terminal attached to the metallic sheathing of the Council's underground cable, this connection being additional to the earthing connection specified in the S.A.A. Wiring Rules.

The earth leakage circuit breaker and any auxiliary gear referred to in Sub-Clause (i), together with the necessary connections, and also additional earthing conductors necessary to comply with Sub-Clause (ii), must be provided and installed by the customer.

The Council will provide the special terminal on the cable sheath required by Sub-Clause (ii), and its officers will connect the earthing conductor to the special terminal.

(iii) Council's Original Requirements Modified.

Service Rule No.36 considerably modifies the Council's original requirements regarding the use of earth leakage circuit breakers.

Whereas previously the Council required selective protection of each sub-installation, it now merely requires that every part of an installation shall be protected against earth leakage by an earth leakage circuit breaker.

The whole of the installation may be protected by one circuit breaker or by a number of circuit breakers, which need not be arranged for selective operation.

If the required loading is greater than 30 amperes but does not exceed 60 amperes, the 30 ampere cartridge fuse may be replaced by a standard S.C.C. "B" type fuse with the contact blades removed, or by a standard "A" type fuse with the sides of the contacts removed.

Each of the switch-fuses will be provided with a notice which will carry the Sydney County Council's serial number and the following information:-

"Switch-Fuse

The Property of The Sydney County Council

On loan only to the occupier of the premises."

Each switch-fuse, before being placed in stock, will have attached to it an "Undertaking to Pay" form made out in the following manner:-

"I hereby request The Sydney County Council to loan me a switch-fuse for seven (7) days. I agree to return the switch-fuse to The Sydney County Council in good order and condition or, if the switch-fuse is damaged or lost, to pay to the Council the cost incurred by the Council, as certified by the General Manager of the Council, of repairing or replacing the switch-fuse. I agree to make that payment within three (3) weeks after the receipt by me of an account for such amount from the Council. I also hereby acknowledge receipt of the switch-fuse.

Dated this _____ day of _____ 19____.

SIGNATURE: _____

Address to which account is to be forwarded:

_____".

When an Emergency Service Officer discovers circumstances in which, in accordance with the foregoing, a switch-fuse should be loaned to the customer, the following procedure will be carried out:-

- (a) The Emergency Service Officer will obtain the signature and address of the customer on the "Undertaking to Pay" form attached to the switch-fuse. He will then erect and connect the switch-fuse.

Should it be necessary to obtain a switch-fuse from an Emergency Service Depot, the Emergency Service Officer will contact the Despatch Officer who may decide to forward the switch-fuse to him by another officer if by so doing time would be saved.

- (b) The Emergency Service Officer will leave a "Further work" card instructing the customer to have defective switchgear, etc. repaired or replaced within seven (7) days.

ITEM NO.2 - PROTECTION OF ELECTRIC INSTALLATIONS AGAINST EARTH LEAKAGE.

2.1 - General.

Electric installations which, in accordance with the S.A.A. Wiring Rules must be earthed, will be approved for connection to the mains of the Council only if each installation is protected against faults to earth as under:-

(i) In the Area Supplied Through Overhead Mains and Overhead Service Wires.

By an earth leakage circuit breaker or breakers complying with the Approval and Test Specification No.C.110(issued by the Standards Association of Australia) and installed in accordance with the appropriate requirements of the S.A.A. Wiring Rules.

(ii) In the Area Supplied Through Underground Cables.

By bonding the main earthing conductor of the installation to a special terminal attached to the metallic sheathing of the Council's underground cable, this connection being additional to the earthing connection specified in the S.A.A. Wiring Rules.

The earth leakage circuit breaker and any auxiliary gear referred to in Sub-Clause (i), together with the necessary connections, and also additional earthing conductors necessary to comply with Sub-Clause (ii), must be provided and installed by the customer.

The Council will provide the special terminal on the cable sheath required by Sub-Clause (ii), and its officers will connect the earthing conductor to the special terminal.

(iii) Council's Original Requirements Modified.

Service Rule No.36 considerably modifies the Council's original requirements regarding the use of earth leakage circuit breakers.

Whereas previously the Council required selective protection of each sub-installation, it now merely requires that every part of an installation shall be protected against earth leakage by an earth leakage circuit breaker.

The whole of the installation may be protected by one circuit breaker or by a number of circuit breakers, which need not be arranged for selective operation.

Control and ProtectionITEM NO. 2 (Cont'd.)2.2 Installation and Connection of Earth Leakage Circuit Breakers

S.A.A. Wiring Rules (Earthing Section) cover the essential requirements for ensuring satisfactory earthing of electrical equipment.

These rules also cover the additional requirements for protection of installations against earth leakage by the use of earth leakage circuit breakers.

Reference to those Wiring Rules will show that the connections for protection by earth leakage circuit breakers are such that basically the installation is earthed in the traditional manner (direct earthing) and in addition, the direct earthing system is connected to one end of the tripping coil of the earth leakage circuit breaker (Terminal F), while the other end of the coil (Terminal E) is connected to an independent earthing electrode.

2.3 Earth Leakage Circuit Breaker Used For Relay Operation

As earth leakage circuit breakers complying with Specification C.110 are not obtainable with ratings of more than 50 amperes, it is necessary, when protecting an installation having a maximum demand of more than 50 amperes, to use the earth leakage circuit breaker as a relay to control an ordinary circuit breaker, or other suitable control device of higher rating.

(The normal earth leakage circuit breaker opens the circuit upon the occurrence of an earth fault. For relay operation, this type of circuit breaker may be used, or alternatively, another form of earth leakage circuit breaker, which closes the circuit upon the occurrence of a fault, may be used.)

With an earth leakage circuit breaker connected as a relay, the contacts of the earth leakage circuit breaker may be connected in series with the low voltage or holding coil. A better method is to use a circuit closing earth leakage relay in series with a shunt trip coil on the circuit breaker. This will not be affected by any momentary disturbance which may occur on the mains, and there will be no trouble with the noise, which is usually produced by the low volt coil. (See diagram attached for connections, Fig. 2).

2.4 Protection of Separately Metered Parts of an Installation by one Circuit Breaker

If two or more separately metered parts of an installation are to be protected together by one circuit breaker, that circuit breaker must be connected between the point of supply and the metering links.

Control and ProtectionITEM NO. 2 (Cont'd.)2.5 Use of Earth Leakage Circuit Breakers as Main Switches

If the number and arrangement of earth leakage circuit breakers comply with the relevant requirements of the Wiring Rules, the circuit breakers may constitute the main switch for the whole of the installation supplied through the service.

2.6 Selective Protection

It is possible that a customer or the owner of the installation may desire selective protection for other parts of an installation. S.A.A. Wiring Rule - (Selective Protection) draws attention to the precautions which must be taken and sets down the minimum requirements for satisfactory operation.

Fundamentally, the problem is simply that of keeping the exposed metal of each portion of the installation, which is to be kept separately protected, electrically isolated, from the exposed metal of every other separately protected portion. Exposed metal in this sense includes conduits, frames, and earthing conductors.

The problem may be solved by:-

- (a) The use of steel conduit, which is kept apart from metal structures, gas and water pipes, etc., and from the conduit of other separately protected portions of the installation.
- (b) The use of "all-insulated" material, including insulated conduit and tough rubber covered cables.

In all cases, the earthing conductors of each separately protected portion of the installation must be kept electrically clear of other earthing conductors or exposed metal right up to the "F" terminal of the earth leakage circuit breaker.

The following paragraphs describe installation methods, which will satisfactorily provide selectivity in accordance with the foregoing:-

(1) Standard (Steel) Conduit Wiring (Where Adequate Isolation is Possible)

In wood frame structures or in structures with walls of brick and floors of wood, it is usually easy to isolate the exposed metal of each portion of the installation, which is to be separately protected from the exposed metal of other parts. Therefore, in such cases, the installation may be earthed by connecting the exposed metal of each portion of the installation to the "F" terminal of the appropriate circuit breaker and connecting the

Control and ProtectionITEM NO. 2 (Cont'd.)

2.6 (Cont'd.)

"E" terminals of all the circuit breakers to one "electrode". In such cases, no direct earthing connection must be made nor any accidental electrical connection allowed to exist between the exposed metal of any portion of the installation and water pipes, gas pipes or other conductors existing in the structure.

This method is shown in detail in Figure 2, page 178 of the S.A.A. Wiring Rules (Simple Installation Only).

(2) Tough Rubber Covered Wiring or All-Insulated System

In building of reinforced concrete and similar structures, it is seldom practicable to keep the steel conduits of one part of the installation clear of the conduits of other parts of the installation, particularly because of the existence of steel reinforcing in the concrete. In such cases, a system of wiring must be used which does not include metallic protective sheaths. Such systems are those which use tough rubber cable or insulated conduits.

If tough rubber covered cable is used, the conductor is "double insulated" and it is not necessary to earth any conduits enclosing only tough rubber covered cable and it is therefore immaterial whether such conduits in different parts of the installation touch each other.

This method of wiring does not require that any connection is made to the water or gas pipes but is connected to an independent electrode. However, should rising mains of braided rubber insulated cable be used, the conduits enclosing those mains would have to be protected by a main earth leakage circuit breaker or circuit breakers, and would have to be connected to the water and gas pipes in addition to being connected to the "F" terminal of the main circuit breaker.

(3) Insulated Earth Wire System

This method of protection gives only partial selectivity. Completely selective protection is obtained with respect to faults in apparatus, but no selectivity is obtained with respect to faults in wiring in conduit, except by the operation of fuse elements in certain cases. The method permits the use of steel

Control and ProtectionITEM NO. 2 (Cont'd.)

2.6 (Cont'd.)

conduits without isolation, but requires the use of insulated earthing conductors within those conduits and also requires a "main" earth leakage circuit breaker for the whole installation in addition to a circuit breaker for each portion of the installation which is to be separately protected.

(4) Special Treatment of Water Heaters for Selective Operation

Some water heaters have metal frames and as those metal frames are usually in contact with the incoming and outgoing water pipes, the frames of all the heaters in an installation would normally be electrically bonded together by the water connections. Therefore, when selective protection is required for any part of an installation which includes a water heater with a metal frame, it is necessary to use insulated water couplings to isolate the frame of that heater from the water pipes. An insulating joint will always be required in the cold water pipe and will also be required in the hot water pipe if that hot water pipe is anywhere in contact with the cold water pipe or any other earthed metal of another portion of the installation.

2.7 Special Treatment of Installation Including Lifts Which May Convey Persons

S.A.A. Wiring Rules require that electrically controlled lifts which may convey persons shall be supplied by circuits which originate at a point on the supply side of the main switch or switches, from which point the lift circuits shall be entirely separate from every other portion of the installation, except that any lighting fittings, outlets, or any equipment in the lift car, shall be connected to the independent lift circuits.

To comply with this Rule, electrically controlled lifts forming part of an installation protected by earth leakage circuit breakers must be protected by independent circuit breakers. If there is more than one such lift in the installation, all the lifts may be protected together. The lift portion of the installation must either be arranged for selective protection with respect to other portions of the installation or the circuit breaker or circuit breakers protecting the lift must be fitted with a time delay mechanism approved by the Council. When such time delay mechanism is used, all the circuit breakers of the installation may be connected in the same way as they would be for non-selective operation.

ITEM NO.2 (CONT'D).2.8 - Marking of Earth Leakage Circuit Breakers.

The S.A.A. Specification No. C.110 includes standard marking of terminals thus:-

L ₁ , L ₂ , L ₃	-	Actives on Line Side.
A, B, C	-	Actives on Load Side.
N	-	Neutral.
F	-	Conduit, Frames and Cases.
E	-	Electrode.

On earth leakage circuit breakers manufactured in Germany, the marking of terminals is as follows:-

T	-	Active on Line Side.
W	-	Active on Load Side.
O	-	Neutral on Line Side.
O'	-	Neutral of Load Side.
K	-	7/.029 Conductor from Conduit.
H	-	7/.029 Insulated Conductor to the Electrode.

(See diagram attached for connections. Fig. 1).

The A.E.G. earth leakage circuit breakers first submitted for test were marked 415V 25A and were tested with 415V between the contacts. Later models identical in all other respects have been marked 240 V. Permission has been given for their use on 2 phase 415V. circuits provided the 240V marking is removed and adequate marking substituted. This marking must include:-

415V 25A 2 phase
Connect L₁ to T₁ L₂ to O load to W and O'.

2.9 - Checking and Testing Earth Leakage Circuit Breakers.(1) General.

The following information on earth leakage circuit breakers is given so that Emergency Service Officers may have some guide as to the probable fault when it is found that a defective earth leakage circuit breaker is the cause of failure of supply to a customer's installation.

It shall not be the function of Emergency Service Officers to investigate defects in earth leakage circuit breakers but obvious minor adjustments may be made where possible.

In certain circumstances, temporary bridging of an earth leakage circuit breaker is permitted (See Item No.1 of this Section).

ITEM NO.2 - (CONT'D).

The action taken, together with full details of the make and type of circuit breaker and defect if known, will be recorded by the Emergency Service Officer on a Service Report for the information of the Chief Installation Inspector.

(ii) - Location and Identification of Defects in Earth Leakage Circuit Breakers.

When operating the test button, one of four things will be noted:-

- (a) There will be no effect.
- (b) A hum or buzz will be heard in the circuit breaker.
- (c) The circuit breaker will trip after humming for about two or three seconds.
- (d) The circuit breaker will trip instantaneously.

(a), (b), (c) indicate a defective condition.

(a) If Checking With the Test Button Produces no Effect.

Operate the circuit breaker manually four or five times then try the test button again. The mechanism may have been slightly jammed and this procedure will free it. Although this operation only affects directly the toggle mechanism, the vibration may free any stickiness in the armature.

(b) If the Operation of Test Button Causes the Circuit Breaker To Hum or Buzz, or

(c) To Trip After Humming two or three seconds.

This may be due to:-

- (i) Armature sluggish or stuck.
- (ii) Faulty relay coil or open circuited operating coil on T and H and Model L Pritchett breakers only.
- (iii) High resistance value of test resistor.
- (iv) High earth/electrode resistance.
- (v) Incorrect calibration.
- (vi) Faulty toggle mechanism. (This defect may be distinguished from those which would be indicated by (i) to (iv) above, by the fact that the buzz would be loud, as distinct from the hum experienced with the other types of defects.

2.10 - Details of Troubles That Have Been Frequently Experienced With Different Types of Earth Leakage Circuit Breakers.

A.E.G.

A trouble experienced with these circuit breakers is that the pin holding the arm of the test switch to the shaft breaks, thus

ITEM NO.2 (CONT'D).

rendering the test switch inoperative. This defect can be noticed when an attempt is made to operate the test switch because, when this pin is broken, either the knob can be turned without any resistance to the motion being felt, or the knob is so stiff that it cannot be turned.

Occasionally open circuits have been found in the testing resistor but this trouble is not common with this make of circuit breaker.

B. & H.

Sometimes trouble is due to high value of the testing resistor or open circuit in the testing resistor. The tripping mechanism has sometimes been found defective and the armature of the tripping coil has been stuck (occasionally it has been found that when the circuit breaker is mounted in a position where it is exposed for long periods to the afternoon sun the sealing wax used in the assembly has melted and run into the mechanism. This trouble should be experienced on only the earlier models).

The closing mechanism has sometimes been broken and in some cases the toggle mechanism appears to slip. The exact cause of this trouble is not known but it can sometimes be rectified by tapping the side of the circuit breaker with a screw driver. Possibly this is due to the bearings of the armature becoming stiff so that, while the testing current is sufficient to pull the armature up, gravity is insufficient to return the armature to the "Off" position. Consequently the toggle is not reset.

Where difficulty is experienced in resetting B-H circuit breakers do not exert any undue force when turning the control knob in a counter-clockwise direction as it is possible to seriously damage the mechanism and increase the cost of the repairs. This care is specially necessary in the case of breakers having nickle-plated cover retaining screws; breakers so fitted have the toggle arm secured to the shaft only by a shallow spline.

Federal

A common fault is that the toothed wheels fastened to the testing button and to the shaft on which the testing switch is mounted do not mesh, or mesh so deeply that the testing button cannot be turned.

The testing resistors used in Federal breakers are frequently found open circuited and another frequent cause of failure is that the flexible connection from the toothed wheel on the shaft of the testing switch is caught between the body of the circuit breaker and the cover, so that the flex is stretched when the testing shaft is turned. This stretching is often sufficient to break the flex.

Officers should exercise care when replacing covers of Federal earth leakage circuit breakers that they do not jam this flex between the cover and the body of the circuit breaker.

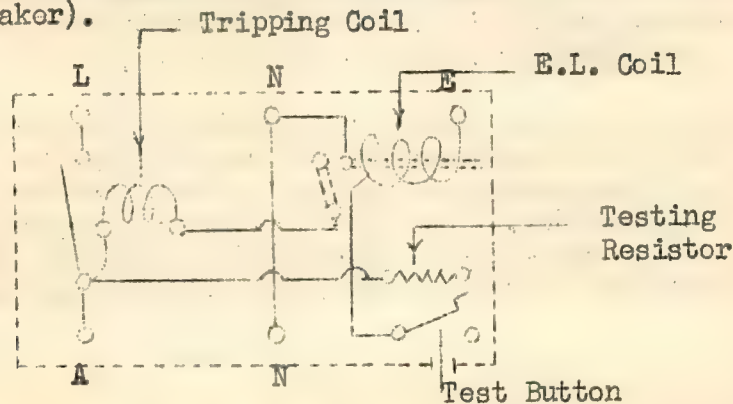
ITEM NO.2 (CONT'D).

Sometimes the tripping mechanism of Federal circuit breakers becomes faulty because of stiffness in the armature bearing which prevents the armature from moving. Sometimes the trouble is remedied by applying the 100 ohm resistor between the A and E terminals or A and F terminals. The excessive vibration thus set up apparently removes the stiffness.

The trip coil is sometimes open circuited. This is sometimes due to stiffness in the circuit breaker preventing its tripping when a fault occurs in the installation. The current due to the fault continues to flow in the circuit breaker coil which overheats and eventually opens circuits. Stiffness in any other make of circuit will have the same result.

Pritchett.

There are three types of Pritchett earth leakage circuit breakers on the market, the earliest type (Model 1) having a porcelain body with a cover of moulded insulating compound. In this type the armature of the earth leakage tripping coil does not operate directly on the toggle mechanism but when a fault occurs this armature is attracted and closes the circuit for a separate tripping coil, the armature of this tripping coil working directly on the tripping mechanism. (See sketch for the internal connections of this type of circuit breaker).



Some trouble has been experienced with high value of the test resistor and open circuit in the test resistor but the main source of trouble of this circuit breaker is the incorrect calibration of the earth leakage coil and the fact that the closing mechanism wears, making the circuit breaker susceptible to vibration and also difficult to reclose.

The Model 2 and Model 3 Pritchett earth leakage circuit breakers have the outer casing made wholly of moulded insulating compound, the dimensions being approximately 4" x 3" x 1½" deep. In the second type the operating knob is screwed onto the shaft which operates the closing mechanism, while in the latest type this knob has a sliding fit on the operating shaft.

ITEM NO.2 (CONT'D).

In both these types trouble has been experienced with open circuits in the testing resistors and with faults in mechanical adjustment or to stiff bearings in the tripping mechanism.

In the latest model Pritchett circuit breakers the calibration of the tripping coil of some of the breakers may be varied by means of a screw through the right hand end of the bottom case. The adjustment screw bears on the armature and care must be taken to leave it securely sealed by wax after adjustment. This screw is a steel one. If it not possible to calibrate the breaker correctly with this screw, good results have been obtained by substituting a 3/16" brass screw.

Standard "A".

While some trouble has been experienced with high value of test resistors and open circuits in the testing resistors on this make of circuit breaker, the most frequent trouble in the testing circuit has been that due to the testing button being too short, or to a "fin" being left on the cover moulding around the hole in which the test button moves. The contact arm on the test switch cannot be pushed in sufficiently far to touch the contact connected to the testing resistor. The trouble can generally be removed by filing the cover or by filing the shoulder of the test button. This same trouble has been experienced where the cover has not been fitted properly because of cables passing beneath it or where the screws holding the cover in place have not been sufficiently tightened.

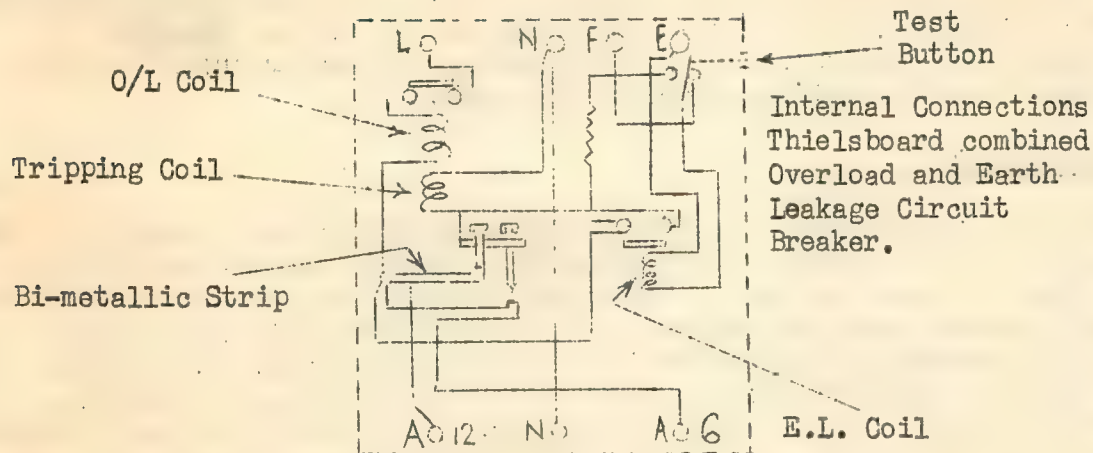
Sometimes the tripping mechanism is faulty. In some cases this has been found due to the adjustment screw jamming on the side of the hole in the armature (this is easily rectified by bending the adjustment screw). Occasionally, it has been noticed that the bearing on the hammer release arm is stiff and prevents the armature completing its travel. Therefore, the hammer is not released and the toggle mechanism is not tripped.

Stiffness of the toggle sometimes prevents the hammer from "breaking" the toggle and opening the breaker. As the hammer cannot be reset unless the breaker is moved from "Off" to "On", a breaker in this state can neither be opened by a fault current nor by the mechanical trip.

Sometimes it has been found difficult to reclose Standard "A" circuit breakers. Generally this has been due to joints in the toggle being reset by gravity. In one case the hammer release arm had been too finely set (or has worn) so that the hammer was not held down.

ITEM NO.2 (CONT'D).T. & H.

In the case of T. & H. combined overload and earth leakage circuit breakers (Thielsboards) it has been found that when connected to water heaters or any other equipment having a rating approaching that of the thermal strip, the circuit breaker has tripped for no apparent reason. The usual cause of this trouble is that the calibration of the thermal strip is incorrect.



In the early T. & H. earth leakage circuit breakers the contacts actuated by the earth leakage coil were of light construction with the result that on the occurrence of a heavy earth fault, the bridging piece attached to the armature of the coil became jammed between the contacts, thus tripping the circuit breaker immediately an attempt is made to reclose it.

Occasionally the closing mechanism has been found defective.

Westinghouse.

The testing switches on the Westinghouse circuit breakers have given a certain amount of trouble. Sometimes the hole in the cover in which the testing knob slides has been made too large so that the testing knob is not pushed in straight and might not press against the contact arm of the testing switch.

Sometimes the knob presses against the contact arm very heavily thus straining this arm with the result that when pressure on the arm is released the arm does not make contact with the F terminal of the switch. If this defect is present, an ohmmeter test will indicate an open circuit in coil circuit. At times the fixed contact connected to the testing resistor becomes bent and the contact arm does not touch it.

ITEM NO. 2 (Cont'd)

Another source of trouble has been that the earth leakage coil, to the end of which the testing switch is fastened, becomes loose in the base. The testing resistor used for this make of circuit breaker is more liable to have a high resistance than the resistors used with other circuit breakers.

The tripping action of the Westinghouse earth leakage circuit breaker is that a screw attached to the armature strikes a spring bent into an "S" shape when a fault occurs, thus causing the spring to suddenly assume a "D" shape and in doing so the spring hits the toggle mechanism, thus tripping the circuit breaker.

Unless the armature is properly adjusted it will be found that the screw touches the "S" spring while the armature is still some distance from the pole piece of the tripping coil, in which position the magnetic pull is weak. Consequently, as there is very little momentum in the armature at that stage of its travel, the screw does not trip the "S" spring but merely bounces against it causing a humming noise. Early Model Westinghouse E.L.C.B.'s were lubricated with an oil which has since been found to form a varnish like film over the working parts. This film causes the mechanism to stick so that the breaker will not trip when the test button is pushed but merely buzzes.

The connections of the electrode and the earth wire of the installation from the coil of the Westinghouse circuit breaker are made by means of a small two pin plug which fits into the back of the body of the circuit breaker. Sometimes the pins of this plug do not make good contact.

The test circuit on multipole breakers is taken from only one pole, and in some cases reduction in load on an installation necessitates the removal of meters, care should be taken to leave "alive" the pole to which the test circuit is connected either by leaving that meter connected or, in special cases, by the connection of a "jumper" between the energised "load" terminal and the terminal to which the test circuit is connected.

The bearings of Westinghouse circuit breakers and the operating mechanism are all connected to one of the moving contacts. Therefore, when the circuit breaker is closed this metal work is "alive".

The latest model Westinghouse E.L.C.B. is known as the E frame type and is distinguished by the presence of tubular rivets which hold the two parts of the body together. No attempt shall be made to open or repair this type.

2.11 - Bridging Defective Earth Leakage Circuit Breakers

From the 1st March 1967 it has been Council policy to connect all new installations to the M.E.N. system of earthing.

All services over 100 amps. have already been changed to M.E.N. and some 100 amp. services have also been converted to the M.E.N. system.

As existing services below 100 amps. will not be converted to M.E.N. system unless desired by the customer or, unless alteration and additions are made

which will increase the demand beyond 55 amps., or, where the E.L.C.B. has been removed or rendered non automatic. In these cases where E.L.C.B.'s have been removed or rendered non automatic the main earth or frame wire and the electrode wire shall be bridged together to improve the main earth on the installation pending a visit by a C.I.I. officer who will then decide whether E.L.C.B. will be replaced or conversion to M.E.N. will be effected.

2.12 - Repairs to Earth Leakage Circuit Breakers

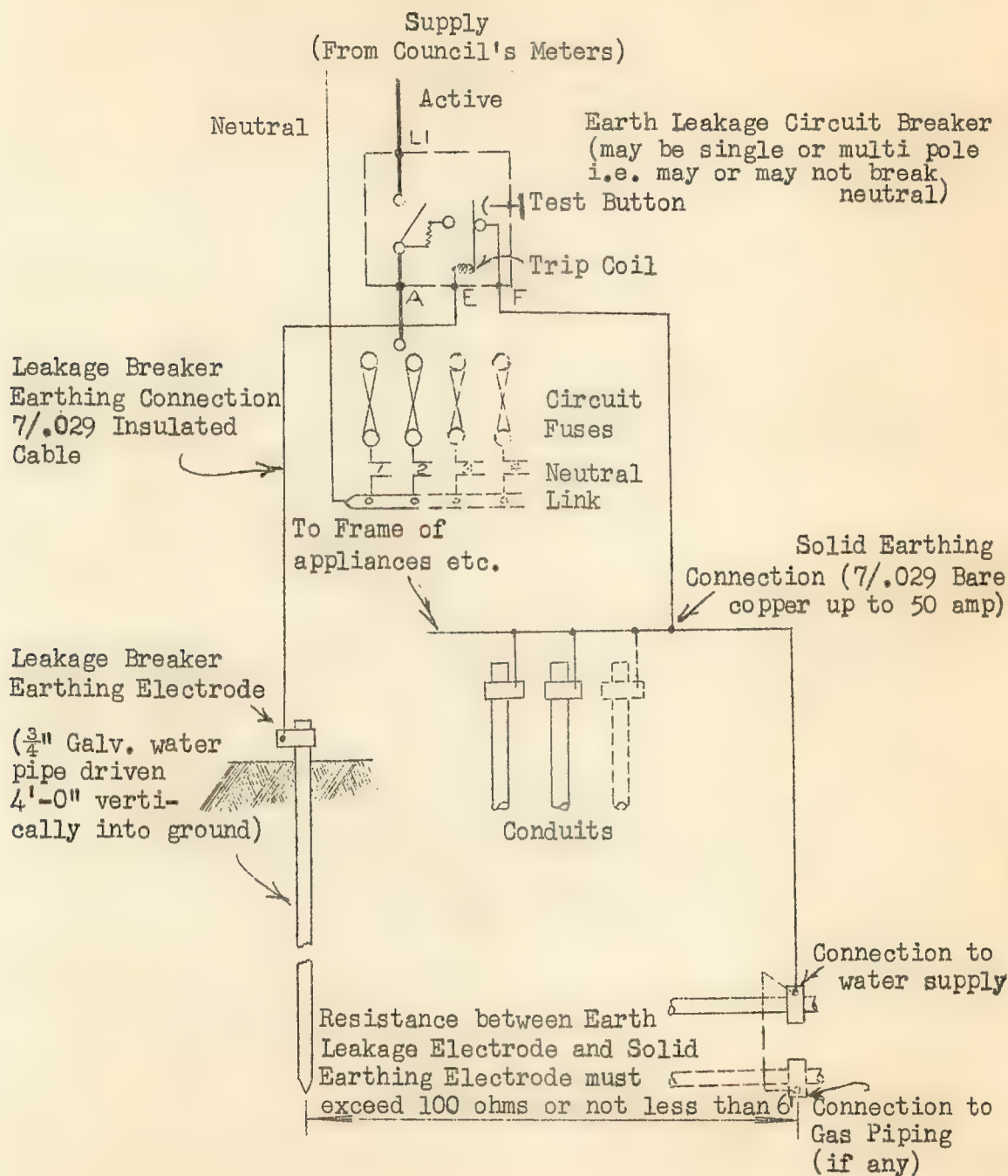
Emergency Service Officers shall not refer customers to Electrical Contractors for repair of earth leakage circuit breakers, but shall, after taking the necessary steps to restore supply, refer the matter to the Chief Installation Inspector (C.I.I.), except in the case of Housing Commission property, when the defect shall be reported to the Housing Commission.

The Chief Installation Inspector will arrange for an officer with specialised equipment, not carried by Emergency Service Officers, to make an early test of the earth leakage circuit breaker and, if possible, make repairs at no cost to the customer.

If the Installation Inspector cannot repair the earth leakage circuit breaker, he shall give the customer the necessary advice concerning repair or replacement by an electrical contractor.

Emergency Service Officers shall not make any adjustments to the mechanism of earth leakage circuit breakers, and the mechanism of earth leakage circuit breakers must not be lubricated in any way.

CONNECTIONS OF EARTH LEAKAGE CIRCUIT BREAKERS ON SIMPLE INSTALLATIONS
(i.e. where only one Earth Leakage Circuit Breaker is to be used)



1944

THE UNITED STATES OF AMERICA
DEPARTMENT OF THE ARMY
HEADQUARTERS, ARMY AIR CORPS
WASHINGTON, D. C.

OFFICE OF THE CHIEF OF STAFF
AIR FORCE

MEMORANDUM FOR THE RECORD
SUBJECT: [Illegible]

1. [Illegible]

2. [Illegible]

3. [Illegible]

4. [Illegible]

5. [Illegible]

6. [Illegible]

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INFORMATION ON THE INSTALLATION OF
EARTH LEAKAGE CIRCUIT BREAKERS

Fig. 1.

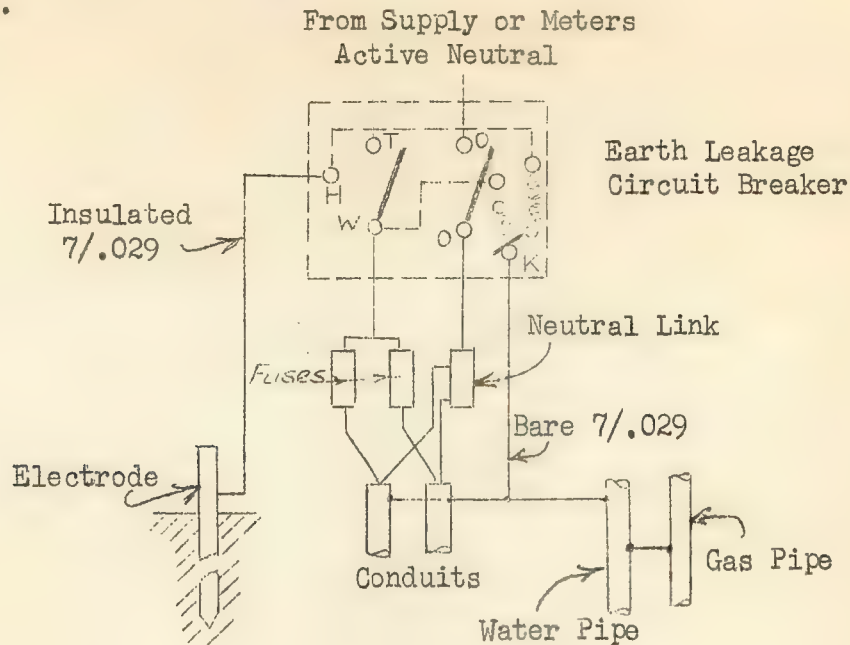
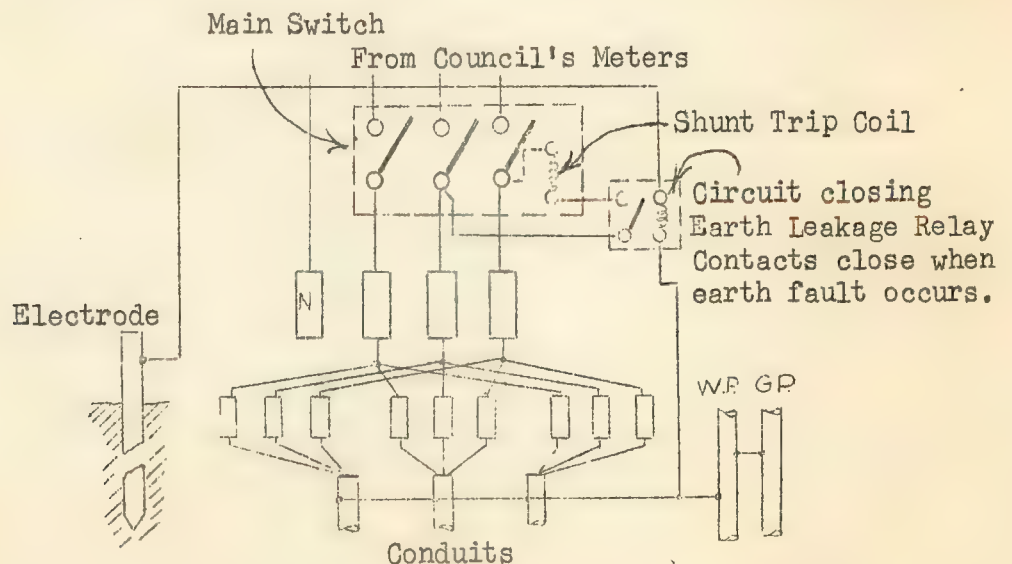


Fig. 2.



Note: Main switch may be Air Circuit Breaker, Oil Circuit Breaker or On-line Motor Starting Switch. Alternatively a no-volt coil may be used in conjunction with a Circuit Opening Earth Leakage Relay.

Control and Protection

ITEM NO. 3 - Core Balance Earth Leakage Protection

The severity of electric shock depends on the following factors:

- (a) Current flow.
- (b) The duration of the current flow,
- and (c) The path of the current.

- (a) Research into electric shock has determined the following figures:-

A leakage of 1 to 3 milliamps can be felt whereas 10-15 milliamps makes it hard to let go. A leakage of 25 to 30 milliamps causes chest muscles to contract and the victim finds difficulty breathing. A leakage above 50 milliamps affects the heart and ventricular fibrillation occurs, and a current above 5 amps. paralyses the nerve centres in the heart and prevents the heart pumping.

- (b) The time of contact for ventricular fibrillation to occur is related to the cardiac cycle of the heart and is listed in the table below.

CURRENT (AMPS)	.025	.030	.050	.100	.190
TIME (SECONDS)	5.75	4.00	1.45	0.36	0.1

A time of 0.1 seconds is considered the minimum time required.

- (c) The above figures are for contact from hand to hand, hand to foot or head to foot, where the current path passes the heart and respiratory centres. Contact from foot to foot is less severe. The magnitude of the current that flows through the human body under the influence of the electric shock is a function of the applied voltage and contact resistances of the current path through the human body and other external resistances in circuit during the period of contact.

From the above statistics can be seen the necessity for the rapid disconnection of supply, in the event of sufficient leakage current, to cause shocks, flowing after an earth fault has occurred.

The Core Balance Earth Leakage Unit offers this protection.

It is extremely sensitive and will operate on a leakage current of .020 amps. $\pm 25\%$, and is guaranteed to trip the circuit breaker in less than half the established fatal time. This type of unit is not dependant on an effective earth for its successful operation, as is the voltage operated earth leakage system. In theory the sensitivity is high enough to eliminate nuisance tripping on normal leakage from sheathed elements on ranges and hot water tanks and suppressor capacitors etc., but the manufacturers recommend that these appliances be separately controlled from the light and power sub-circuits.

Control and Protection

The principle of operation is as follows:- The supply conductors are passed through a sensitive toroid current transformer. While the load current is normal the vector sum of the currents in the conductors is zero, whether the system is M.E.N., E.L.C.B. or direct earthing and either 2, 3 or 4 conductors. This means that while the system operates without leakage, the total current flow is via the active and neutral conductors and a balance is present even if the currents in each phase are not the same. Therefore, the net flux set up in the high permeability-toroidal magnetic core will be zero.

However, if for some reason current is diverted to frame on the load side of the current transformer, a resultant flux will be produced in the core. This flux induces a voltage in the secondary of the C.T. and this potential is used to operate the unit. The current transformer can be built internally into the core balance unit or housed remotely from the controlling circuit breaker.

The three main brands of core balance units in use at the present time are the Heineman, Scanelec and Email "Electroguard" relays. The Heineman and Scanelec units (see diagram 4) have the C.T.s built into the actual units and have only the line and load terminals exposed and both use a similar type of polarised release system. A diagram of this permanent magnet release system is shown below and consists of a yoke (Y), armature (A), permanent magnet (M), operating plunger (P), coils (C) and spring (S). The magnetic flux from the permanent magnet divides into two parts $\phi 1$ and $\phi 2$, the magnitude of $\phi 2$ being varied by the adjustment of the permanent magnet. The flux $\phi 2$ holds the armature in position against the spring tension. When a voltage is induced in the secondary of the current transformer due to leakage, the resultant magnetic forces in the coils in the release unit counteract the flux $\phi 2$ and release the armature and plunger and in turn trip the circuit breaker.

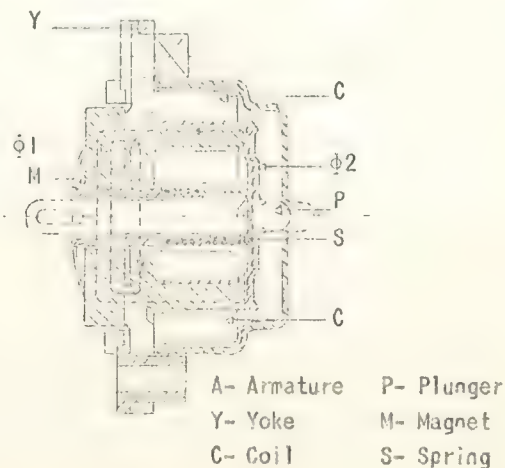


Fig.1

PERMANENT MAGNET RELEASE

The Email "Lectroguard" unit is entirely different in construction and employs a different method of tripping. The unit consists of a Westinghouse Quicklag Circuit Breaker with an external shunt trip coil attached and a toroidal component, which can be housed adjacent to the circuit breaker or remotely in control panels etc. This toroidal unit consists of a current transformer and an electronic circuit composed of an amplifier and relay. When an earth fault occurs and a voltage is induced in secondary of the C.T. this voltage is amplified and operates the relay. Potential is then applied to the shunt trip coil via the relay contacts and trips the circuit breaker.

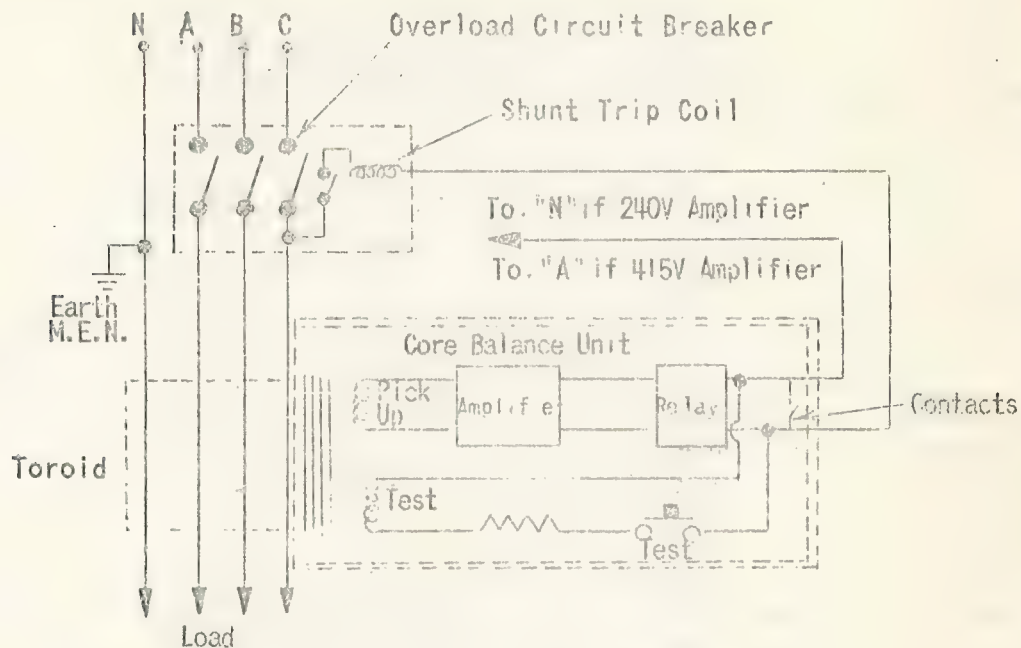


Fig.2

SCHEMATIC DIAGRAM OF "LECTROGUARD"
CORE BALANCE UNIT ON 4 WIRE SERVICE

All new installations of Core Balance Units to replace existing E.L.C.B.s or main switches must be inspected by the E.I.S. Branch and on arrival to attend a "reconnect after repairs" the Emergency Service Officer is confronted with this new equipment, the following action will be taken:-

- (1) Where the installation can be left safe and functional with the core balance unit automatic, supply will be restored and the job referred to the E.I.S. Branch.
- (2) Where the installation cannot be left in a safe and functional condition with the core balance unit automatic or non-automatic. (Email units can be made non-automatic by removal of the shunt trip coil active or neutral conductor), then it will be bridged out either by removal and bypass of the toroid if an exposed type or removal of all load carrying conductors from at least one side of the unit if a composite type. The customer will then be referred to an electrical contractor with advice that a "Ready for Test" form must be submitted, and that although

temporary adjustment has been made, the core balance unit is inoperative as a protective device. Supply would be isolated from any low (240 V) voltage pool lighting circuit if such bridging was carried out. The job would then be referred to the E.I.S. Branch for follow up.

It should be noted that the Council will no longer accept core balance units being connected on the line side of its metering equipment; i.e. as direct replacement for a "master" E.L.C.B.

Installations found with core balance units connected in this manner and awaiting "reconnect after repairs" will be treated as above; the customer being advised to have his electrical contractor contact the E.I.S. Branch to check acceptability of the installation.

Listed below are problems which occur with Core Balance Units:

- (1) All conductors must pass through the toroid in the same direction.
- (2) When testing from active to frame on installations controlled by Core Balance, whether Heineman, Scanalec or Email units, the active testing point must be on the line side of the unit. The main frame connection point must also be on the line side of the Core Balance unit. (See Figs. 3-6).

Warning

Neither these, nor any other known devices, can offer complete protection against the hazards of electric shock, under all conceivable conditions. Core Balance offers protection only when a person makes electrical contact between an active conductor and earth. While this is the most common cause of fatal electric shock, it is of course still possible to receive a shock by making contact with the active and neutral conductors or two active conductors on opposite phases and the core balance unit will not operate under these conditions. It will still be the responsibility of the Em.S.O., when Core Balance units are found installed, to thoroughly check the installation to ensure that all normal safety factors (i.e. effective earthing etc.) are in order in accordance with the S.A.A. Wiring Rules.

Attached are several diagrams of the suggested circuit wiring for single and dual rate installations.

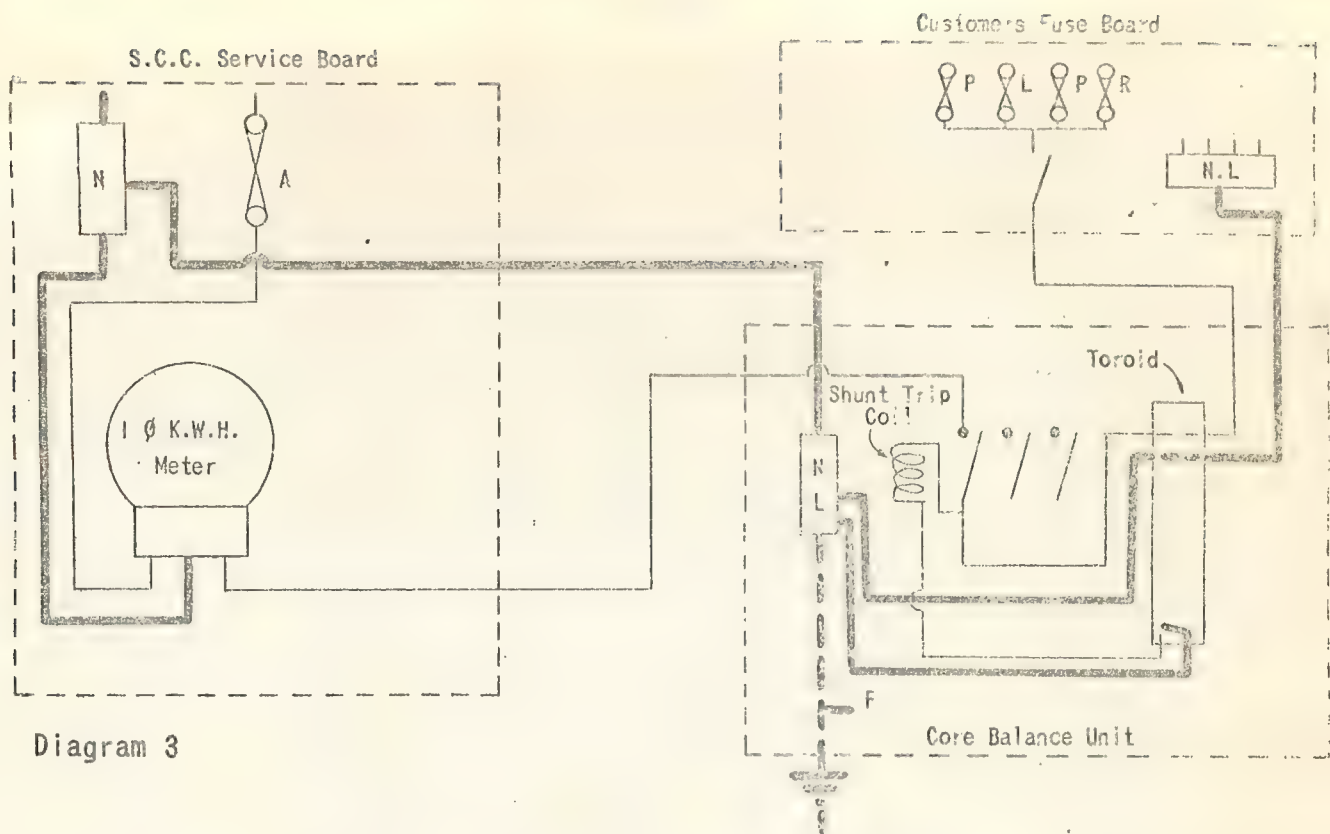


Diagram 3

"LECTROGUARD" SINGLE PHASE. ONE RATE.

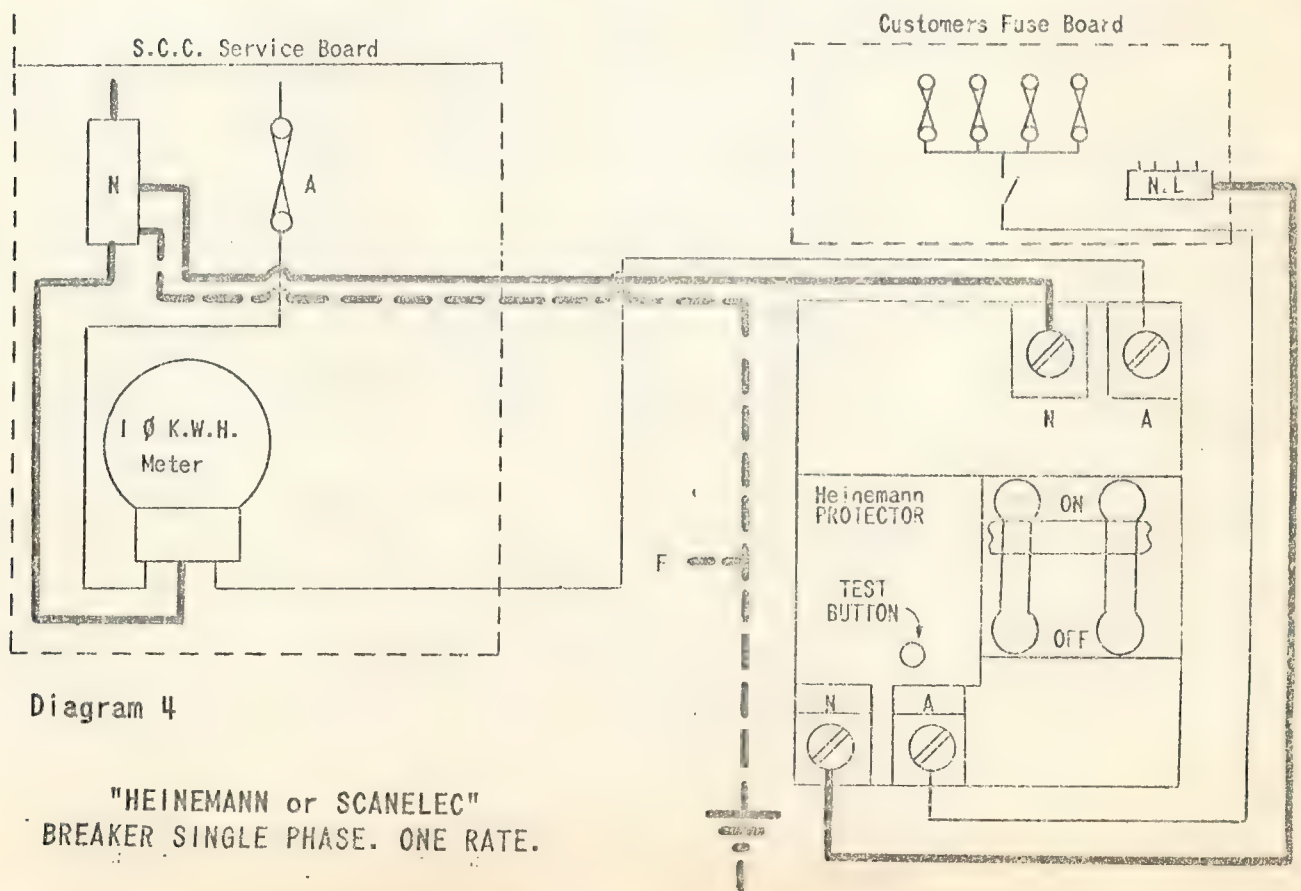
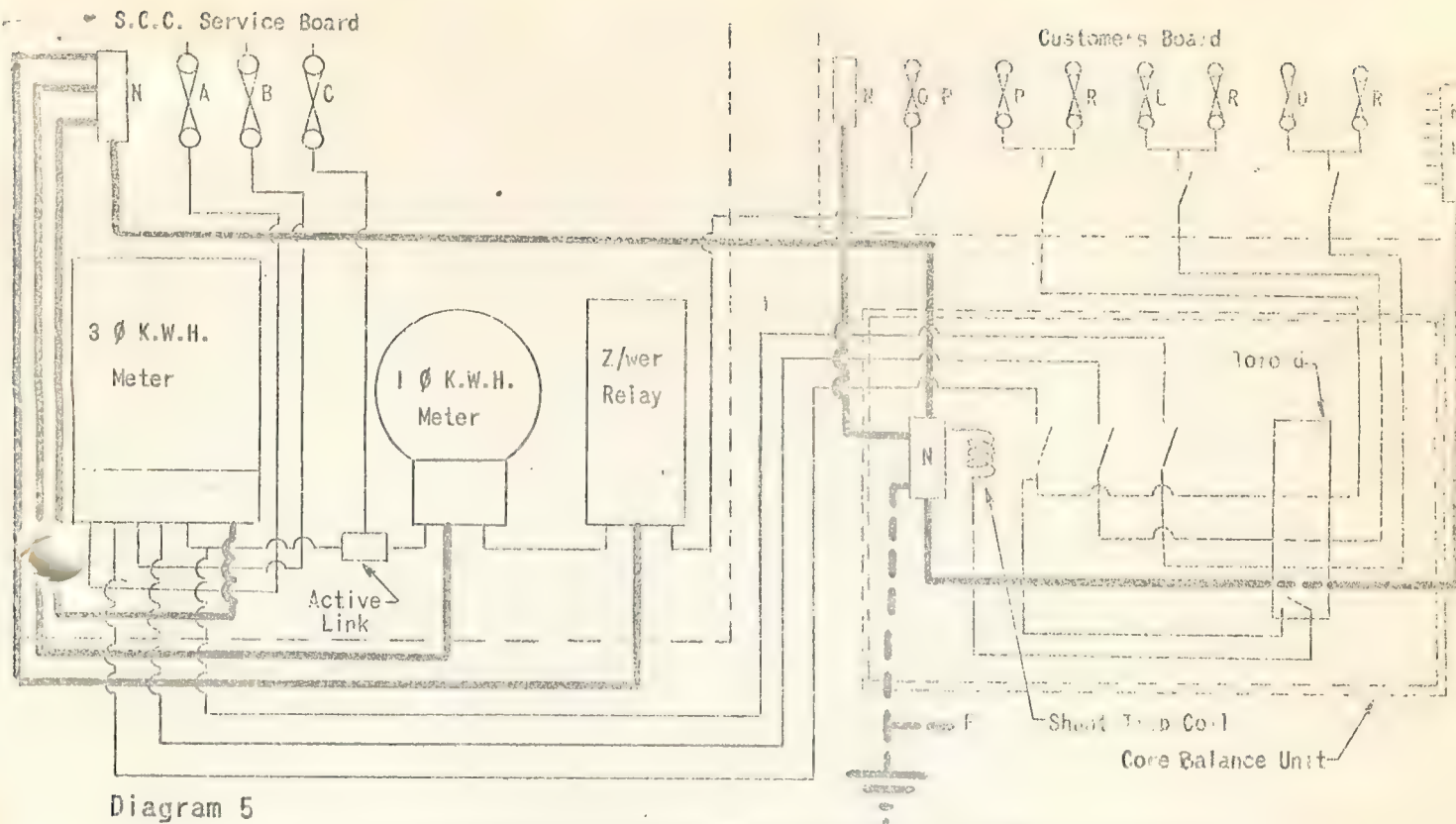
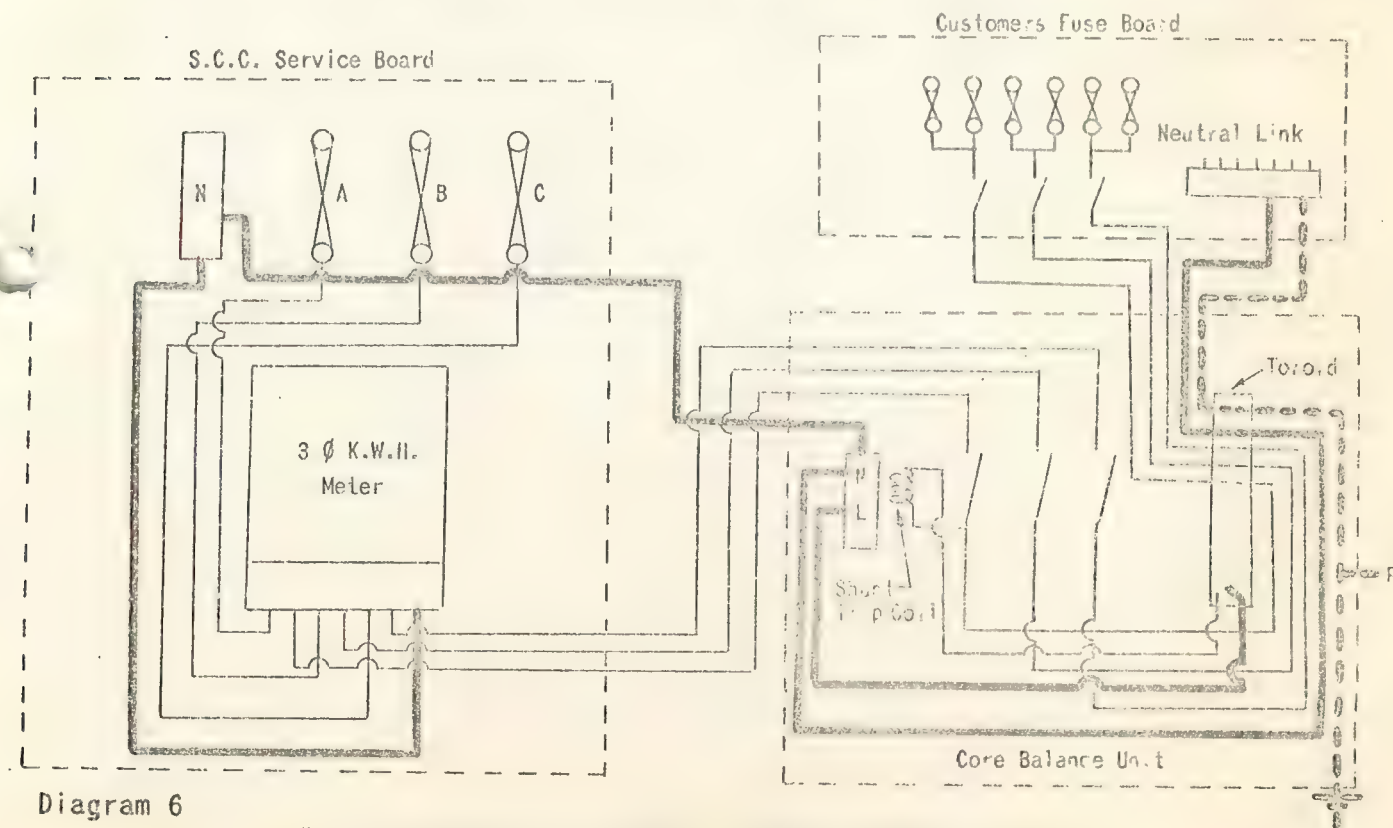


Diagram 4

"HEINEMANN or SCANELEC"
BREAKER SINGLE PHASE. ONE RATE.



"LECTROGUARD" THREE PHASE CONTROL. GENERAL RATE ONLY.



"LECTROGUARD" THREE PHASE. GENERAL SUPPLY RATE.

/HMD.

SECTION NO. 12.
S E R V I C E W I R I N G .

- | | | |
|----------|------|--|
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| | 3.2 | Work Done by Mains Branch Staff. |
| | 3.3 | Assignment of Point of Attachment and Temporary Service Jobs. |
| | 3.4 | Inspection of Mains Connection Boxes |
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| " | 4. | Deteriorated Customers Mains Observed by Officers During the Course of Duty. |
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| | 7.7 | Method of Connecting Temporary Service to Service Lines. |
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| | 7.9 | Return of Wire Used for Temporary Service. |
| | 7.10 | Stocks of Wire for Temporary Service Jobs. |
| | 7.11 | Renewal of Customers Mains in Metal Conduit at Installations Controlled by Earth Leakage Circuit Breakers. |

ITEM NO.1 DEFINITIONS.

Point of Attachment.

The point at which the Sydney County Council's service lines are attached to the customer's premises.

Point of Entry

The point at which the customer's mains or the underground service cable enter a building.

Customer's Mains.

Wiring between the point of attachment and the customer's main switchboard.

Bellmouth.

Bellmouth-shaped fitting attached to the conduit through which customer's mains are drawn at the point of entry in older type services. Its purpose is to prevent brading of insulation of the customer's mains on the end of the conduit.

Mains Connection Box.

A device fixed to premises at the point of attachment to allow connection of customer's mains to the service lines without exposure to direct sunlight. It is installed in lieu of the bellmouth fitting.

ITEM NO.2 GENERAL.

The Bellmouth or Connection Box and wiring between the point of attachment and the customer's main switchboard are the customer's responsibility and, with certain exceptions indicated elsewhere in this instruction, the customer is obliged to arrange for any necessary repairs or renewals at his own expense.

Provision is made, as set out in this instruction, for the Sydney County Council to provide, erect and connect a temporary service subject to certain conditions.

It is the practice, where customer's mains are reported as defective and likely to fail or become dangerous, for the Sydney County Council to write to the customer requesting that he arrange for the renewal of the customer's mains. In these cases the contractor will ask the Sydney County Council to disconnect at the point of attachment when he is ready to commence the work. When the new wiring has been erected he will request the Sydney County Council to reconnect at the point of attachment.

circumstances, wiring shall be cut away or disconnected by the job and the customer referred to a contractor for a effected. Reconnection shall be made when the contractor, Sydney County Council that the repairs have been completed.

occasions the Sydney County Council will provide temporary

these circumstances are dealt with in this section and officers be fully aware of the procedure governing the various circumstances and the charges to be made, so that customers will not be deprived of services that should be given and that customer relations will be enhanced.

ITEM NO.3 - DISCONNECTION AND RECONNECTION AT POINT OF ATTACHMENT.3.1 Work Done by System Operation Branch Staff.

Disconnection and reconnection at point of attachment for renewal or repair of customer's mains or mains connection boxes shall be done as a matter of routine by staff of the System Operation Branch at any hour day or night and will be free of charge irrespective of whether the work arises from failure or otherwise.

The installation of temporary services with or without charge (See Item No.8) and the subsequent disconnection of the temporary wiring and connection of the permanent wiring shall also be done by staff of the System Operation Branch.

3.2 Work Done by Mains Branch Staff.

If an Emergency Service Officer finds that the work cannot be done by System Operation Branch staff because of height or other difficulty, the work shall be assigned to Mains Branch staff. Care shall be taken that Mains Branch staff are not called out after hours to do work which could reasonably be done by System Operation Branch staff.

The cost of the work done by Mains Branch staff will be charged as follows:-

(a) During Ordinary Working Hours.

Disconnection or reconnection at point of attachment irrespective of whether the work arises from failure or otherwise will be done free of charge.

Temporary supply will be given at standard charges (See Item No.7.3)

(b) Outside Ordinary Working Hours.

Disconnection or reconnection at point of attachment will be done free of charge if the customer's mains failed in service. If the customer's mains did not fail in service, the total cost will be charged.

Temporary supply will be given according to standard charges where the customer's mains failed in service. If the customer's mains did not fail in service, the total cost will be charged.

3.3 Assignment of Point of Attachment and Temporary Service Jobs.

Such work shall be assigned to only one officer (Emergency Service Officer or District Operator) except where, in the opinion of an officer, some hazard or difficulty exists and the assistance of a second officer is necessary.

Assistance for steadying ladders, handing tools etc. should be sought from the customer or other willing person so as to avoid the necessity for a second officer being sent to the job.

3.4 Inspection of Mains Connection Boxes.

When it is necessary to inspect terminals and connections in a "live" mains connection box which is in any way suspected of being faulty, the supply should be disconnected at the service taps before removing the connection box cover.

3.5 Disconnection At Point of Attachment For Increase In Service.

Normally any disconnection at the point of attachment where there is to be an increase in service, e.g., from 2 wire to 3 or 4 wire, will be done by Mains Branch staff who will also erect the additional wires and service fuses.

ITEM NO.4 - DETERIORATED CUSTOMER'S MAINS OBSERVED BY OFFICERS DURING THE COURSE OF DUTY.

When officers, in the course of duty, notice that the wiring between the point of attachment and the service fuses is defective, they shall refer the customer to a contractor for renewal of the wiring, provided that none of the circumstances set out in Item No.6 of this instruction headed "Cases Where Customers Will Not Be Referred to Contractors for Renewal of Customer's Mains" exists.

If any of these circumstances do exist, the customer will not be referred to a contractor, but the full particulars will be reported for the information of the Mains Branch.

ITEM NO. 5 - DISCONNECTION OF CUSTOMERS' MAINS

(a) Failure of Mains in Service

Where customers' mains fail at the bellmouth or in the conduit, all wires shall be cut away and the service fuse-links drawn.

If a connection box is installed, the service lines shall be disconnected from the connection box and the ends insulated with adhesive tape. The service fuse-links shall be drawn.

On a 3 or 4 wire service where two connection boxes are fitted and one fails, the leads to this box only need be cut away provided the neutral is in the other undamaged box. Where the neutral is in the box affected, all leads shall be cut away or disconnected. The appropriate service fuse-links shall be drawn.

It is necessary that the service fuse-links be drawn in all cases to avoid the possibility of phase voltage being impressed on the customers' 240 volt installation by reason of burning away of the neutral and/or connection of phase to neutral at the point of defect.

The customers' mains shall not be cut away at any place other than the point of attachment, as electrical contractors are permitted to use the existing cable if, after cutting away the defective portion, sufficient remains to connect to a connection box.

Except as is set out in Item No. 6 of this section, when customers' mains are cut away at the point of attachment, a "Further Work" card setting out the defects shall be left referring the customer to an electrical contractor for repairs to be effected in accordance with the latest wiring rules.

If it is evident that there is a defect at the point of attachment and the officer attending is unable to make the proper disconnection, the service fuse-links shall be drawn and the matter reported immediately to the Despatch Officer who will arrange during general working hours for the Mains Branch staff to attend. Outside general working hours, the service request card shall be passed to the System Operator who will call out staff of the Mains Branch to do the work.

Disconnections of this nature will be made free of charge.

(b) Defective Entry Wiring During Conversion from O.H. to U.G. Service

When a customers' entry wiring or mains connector box fails and there is indication that conversion of the service from overhead to underground is proceeding or is imminent, the customer shall be advised that in his own interest, he should sign an undertaking to pay for a temporary service which would be erected immediately and remain in service while the matter of changing the service was examined.

If it is decided to proceed with the change of service to underground, no charge for the temporary service would be made against the customer. If, however, it is found after examination that there would be considerable delay before the service was changed, the customer would be instructed to have an electrical contractor renew the service to the existing position and would also be required to pay the charge for the temporary service, if erected.

Should the customer refuse to have a temporary service erected under any conditions, the customer shall be advised to proceed with the replacement of the faulty entry wiring.

ITEM NO. 6 - CASES WHERE CUSTOMERS WILL NOT BE REFERRED TO CONTRACTORS FOR RENEWAL OF CUSTOMERS' MAINS.

- 6.1 Customers shall not be referred to contractors for renewal of customer's mains if the service or point of attachment is regarded as being unsatisfactory.

The customer shall be instructed to defer the renewal of the customer's mains until advised by the Council whether any alterations to the service are necessary.

Service conditions which are classed as unsatisfactory are:-

- (a) Meters in an enclosed or inaccessible position. An enclosed position is defined as one, access to which can be locked or one which is enclosed by a wall and requires the use of a ladder to gain access to, e.g. a high verandah.

A snap catch on a verandah door is not considered an inaccessible position, nor is a meter which is erected above the standard eight feet from the floor.

- (b) Service lines which do not have the correct clearance from the ground, roof, verandah, etc., in accordance with S.A.A. Wiring Rules.

Service lines passing over other property where supply could be taken without such crossing is not considered to be an unsatisfactory condition.

- (c) Unsuitable service board positions, such as where it would be dangerous or difficult to replace fuses or where the service fittings are likely to be damaged.
- (d) Service fuses not erected on the service board, e.g. they may be on the back of the verandah plate.
- (e) Where the wiring of a tap-off service from the master service of a pair of semi-detached cottages has failed, and it is practicable to run the entry wiring to the existing or an additional point of attachment on the property which has lost supply. (See Item 6.2).
- (f) Where the point of attachment is situated or constructed in such a manner that it is not practicable for access to be obtained to it while standing on a ladder erected in a normal safe manner.
- (g) Where the point of attachment is situated on the side of a building and the future relocation of S.C.C. pole would prevent the service lines being attached to this point.

Under these conditions, a "free" temporary service shall be installed and the customer shall be given an M.E. 145A card which instructs that the service entry wiring must not be replaced by an electrical contractor until the Service Markers have checked and remarked the service and point of attachment.

6.2 Mains Branch Policy re Common Services When Failure of Consumers' Mains has Occurred.

- (a) If a pair of semi-detached cottages has a common set of service lines attached to the dividing wall between the properties, and the consumers' mains (entry wiring) runs from the point of attachment to one service board (call it "A") and a tap off is taken from the line side of the service fuses and run to a second service board in the next door premises (call it "B") the following procedure is followed, if a failure occurs:-

(i) Failure between Point of Attachment and Board "A"

A free temporary service should be given and a letter written to customer "A" advising the customer to have entry wiring replaced in existing position. Also a letter sent to customer "B" advising that he can either pay half

of the cost of the service in premises "A" and retain the tap off with "A's" approval, or he can wire out separately to the point of attachment from the "B" service position.

(ii) Failure of Tap Off Wiring Between Service "A" and Service "B"

A free temporary service should be given to customer "B" and a letter sent to customer advising that separate consumers' mains (entry wiring) have to be run from the point of attachment to the Service "B".

Note: Where there is animosity between two such neighbours, Council may provide separate sets of service wires.

- (b) If the pair of semi-detached cottages has a common set of service lines and each customer has his own consumers' mains (entry wiring) the failure of one lot of consumers' mains is the responsibility of the customer in the premises supplied by that set of consumers' mains.

No free temporary service would be given and the customer should immediately make arrangements for renewal of mains.

If the service point of attachment is not on the dividing wall and the faulty consumers' mains cross the property of one customer to reach the property of the customer whose supply is affected, the Council will provide a separate set of service lines on the second property if either customer objects to the condition of one customer's consumers' mains being installed on the other customer's property.

Note: It is a condition that each of the semi-detached cottages has a different owner before separate sets of service lines are connected on each half of the building.

(c) Tap Off Wiring From Underground Service

When no supply at service fuses supplied by means of wiring in conduit from an underground service in an adjoining building, and this wiring has become defective, the job shall be immediately referred to the Despatch Co-ordinator for urgent attention.

The Despatch Co-ordinator during normal working hours, will confer with the Mains Branch Foreman for attention by the Mains Branch staff or the wiring staff, or take any other action as is necessary in the circumstances.

Outside normal working hours the job will be referred to the System Operator.

ITEM NO. 7 - TEMPORARY SUPPLY

7.1 Temporary Supply at Request of Customer

Temporary supply may be given, subject to certain conditions, at the request of a customer whose installation has been disconnected at the point of attachment due to failure of the customer's mains or associated apparatus.

In providing temporary supply, no portion of the old customer's mains shall be used. The old wiring shall be completely isolated to facilitate the work of the contractor in renewal.

7.2 Undertaking Form

Before the temporary supply is given, the customer will be obliged to sign an undertaking to pay the standard charge for the work. The Undertaking Form (NM 1405) must be completed and must show the charge applicable.

The Undertaking Form shall be attached to the Emergency Service Officer's Run Sheet.

If the work cannot be carried out by the staff of the System Operation Branch, the Undertaking Form shall be sealed in the right hand S.C.C. fuse box for collection by the Mains Branch.

7.3 Standard Charges

The standard charges for supply and erection of temporary customer's mains between point of attachment and service fuses are as follows:-

- (i) Overhead Services rated up to 70 amps: \$14.00
- (ii) Underground Services and services exceeding 70 amps: Total cost.
- (iii) Replacing services after disconnection at point of attachment or pole for default or failure to comply with Service Rules, or General Conditions of Supply: \$14.00

These charges apply irrespective of the time at which the work is carried out and whether the work is done by the System Operation or the Mains Branch staff.

7.4 Temporary Supply by Mains Branch Outside Ordinary Working Hours

When the work will entail calling out emergency staff of the Mains Branch, the customer shall be informed to this effect and the possibility of some delay occurring before the work can be done shall be explained to the customer. If the customer still wishes to have the service, the Undertaking Form must be prepared and signed and the Emergency Service Officer shall then report immediately by radio to Head Office and the Despatch Officer - Co-ordination will pass the Service Request Card to the System Operator for action.

7.5 Temporary Customer's Mains Installed Free of Charge

Where customer's mains have failed in service and the service or point of attachment is unsatisfactory (see Item No. 6), he shall provide temporary supply and the customer shall not be required to sign the NM 1405 undertaking form although the Emergency Service Officer is required to complete the form with the other relevant details and when the temporary service has been actually installed by him, to forward the form with his Run Sheet to Head Office. Such forms should be clearly marked "free temporary service given".

The customer shall be instructed, by the issue of an M.E. 145A card, to defer the renewal of the customer's mains until advised by the Council whether any alterations to the service are necessary.

7.6 Temporary Supply in Cases Where Service Arrangements Could be Improved.

When the arrangement of the service lines or the customer's mains or point of attachment or point of entry is such that, in the opinion of the officer attending, a better arrangement should be made when renewal is carried out, a signed undertaking to pay (NM 1405) form shall be obtained if the customer requests a temporary service.

The customer shall be instructed, by the issue of an M.E. 145A card, to defer the renewal of the customer's mains until advised by the Council whether any alterations to the service are necessary.

A report setting out how the service conditions could be improved, shall be forwarded to the Assistant Emergency Service Supervisor. The report shall then be forwarded to the Mains Service Supervisor who shall arrange for the service to be inspected and, if necessary, re-marked.

If the customer does not desire to have a temporary supply and elects to have a contractor replace the customer's mains immediately, no further action shall be taken.

Open entry wiring on cleats or intermediate fuses in the entry wiring are not regarded as unsatisfactory service conditions.

7.7 Method of Connecting Temporary Service to Service Lines

Line clamps shall be used for connecting temporary customer's mains to service lines.

Care must be taken that the neutral wire is connected to the correct position even in 2-core services.

The rotation of meters and motors shall be checked before leaving the job.

Plastic hose to be used where necessary.

7.8 Temporary Service Wires Smaller than Wires to be Replaced

When temporary service wires are smaller than those they have replaced, the customer shall be requested to restrict his load to the limit of the capacity of the temporary mains.

7.9 Return of Wire Used for Temporary Service

When an Emergency Service Officer disconnects a temporary service to reconnect the new wiring, he shall label the temporary wiring to indicate the address from which it was recovered and return it to a System Operation Branch Depot for collection by the Supervisor - Emergency Service Officers. Sydenham Depot should be notified of location of wire during normal working hours, and the Des.Co. notified after hours.

7.10 Stocks of Wire for Temporary Service Jobs

Officers must keep a regular check on the amount of 7.036 cable carried in their vehicles to ensure that sufficient is always on hand and shall make arrangements for additional supplies when the amount of cable on the vehicles is reduced to 25 yards, and the $\frac{5}{8}$ " plastic conduit is reduced to 1 yard.

During normal working hours, Monday to Friday, the Senior Depot Clerk, Sydenham Depot, shall be notified when stock is required. Outside these hours, the Despatch Officer shall be notified.

7.11 Renewal of Customers' Mains in Metal Conduit at Installations
Controlled by Earth Leakage Circuit Breakers.

The Electrical Installation Branch will in future inspect customers' mains which have been renewed in metal conduit at installations controlled by E.L.C.B.s.

Officers of the System Operation Branch attending such jobs shall mark the Service Report, "E.L.C.B. existing".

This will not apply where a mains connector box only has been renewed.

SECTION NO. 13.

CUSTOMERS' INSTALLATIONS.

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2. Earthing of Customers' Installations.
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2. When Restoring Supply After Failure.
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4. Removal of Terminal Cover Plates of Apparatus for Inspection.
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SECTION NO. 13.

CUSTOMERS' INSTALLATIONS.

ITEM NO. 1. ORDER OF SWITCHING.

When service fuses or customers' main fuses are found to be open-circuited first open all sub-circuit controls and then open the main control before proceeding to renew the fuses.

After the fuses have been renewed, close the Main Control first and then close the sub-circuit controls.

This order of operation must always be adhered to. It conforms to the standard practice of switching and also eliminates possibility of damage to installations where capacitors (static condensers) are installed, (See Item No. 3A)

ITEM NO. 2. INSPECTION.

1. General.

Emergency Service Officers shall examine the Main Switch and test the main earthing when reconnecting supply.

When access to the rest of the installation can be gained, a cursory inspection only for dangerous defects shall be made.

When attending in response to a request for service, officers shall make an inspection which will be sufficient to determine the cause of failure. A general inspection shall not be made unless the installation is so obviously defective that a thorough inspection is warranted in the interests of safety.

Officers shall not carry the inspection any further than is necessary to complete the work for which they are visiting the premises. If a customer asks for a further inspection the matter shall be referred to the Chief Installation Inspector.

2. Earthing of Customers' Installations.

When carrying out work at a customer's switchboard and there is a doubt concerning the effectiveness of the customer's earth connection, officers shall test the continuity of the earth connections and the insulation of conductors of the customer's wiring (See Item No. 33).

ITEM NO. 3. NO ACCESS TO INSPECT INSTALLATIONS.

1. When Reconnecting Supply.

If an Emergency Service Officer visiting a customer's premises to reconnect supply is able to gain access to the premises to reconnect supply but cannot obtain access to the interior of the premises, he shall leave the Main Switch open when the supply has been reconnected.

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Installations.

When Reconnecting Supply (Contd)

A "Switch Open" card shall be tied to the Main Switch and another placed underneath the door or in such other suitable place.

When access can be gained to reconnect supply, but access cannot be obtained to the interior of the premises and the test shows the installation to be ineffectively earthed, supply shall be left disconnected and a "No Access" Card shall be left in the premises. A subsequent visit, when access can be obtained, may disclose some conditions of the interior installation that would, coupled with the defective earthing, make it dangerous to connect supply.

2. When Restoring Supply After Failure.

If the customer's fuses do not hold and no access to the interior of the premises can be gained, draw the customer's fuse-links and leave a "No Access" card. An inspection during the second visit may reveal defects which may be remedied temporarily.

If supply can be restored but access to the interior of the premises cannot be obtained the main switch shall be left open only when the meter shows that electricity is being used.

When the Main Switch is left open a "Switch Open" Card shall be tied to the main switch and another placed under the door or in such another suitable place.

3. Switchboards Missing.

In cases where the switchboard is missing do not leave a "No Access" Card, but draw the service fuse-links and leave a "Further Work" card.

ITEM NO.4. REMOVAL OF TERMINAL COVER PLATES OF APPARATUS FOR INSPECTION.

When it is necessary to inspect apparatus permanently connected to an installation in order to check if supply is actually applied to the apparatus, care must be taken to interrupt supply to the apparatus whenever possible before removing any terminal covers.

If terminal cover plates are removed from energised terminals short circuits are likely to occur, with consequent damage to customers' apparatus.

ITEM NO.5 RENEWAL OF FUSES.

1. Routine at Customers Promises.

Examine all fuses controlling circuits to the same customer when it is necessary to renew one or more fuses.

ITEM NO. 4. REMOVAL OF TERMINAL COVER PLATES OF APPARATUS FOR INSPECTION

When it is necessary to inspect apparatus permanently connected to an installation in order to check if supply is actually applied to the apparatus, care must be taken to interrupt supply to the apparatus whenever possible before removing any terminal covers.

If terminal cover plates are removed from energised terminals short circuits are likely to occur, with consequent damage to customers' apparatus.

ITEM NO. 5. NECESSARY INSPECTIONS OF FUSES AT CUSTOMERS' PREMISES

When an officer after renewing a fuse to a final sub. circuit, finds that a portion of the installation is still not energised, he shall test the remaining fuses before concluding that there is an open circuit to part.

When all supply has been restored by replacement of a blown fuse, it will only be necessary to examine other fuses, when it appears that some incorrect fuse elements have been fitted.

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Routine at Customers Premises (Contd).

When a fuse link is found open-circuited, renew the fuse link when the type of fuse carrier permits and there is no fault on the circuit.

If a ceramic fuse carrier is broken or missing, bridge the terminals of the fuse with the proper gauge wire placed inside asbestos stockinette to give temporary supply, and leave a "Further Work" Card.

If a cartridge fuse carrier is of a type which does not permit of the renewal of the fuse-element in the proper way, bridge out by linking the contacts of the fuse carrier with the proper gauge wire placed inside asbestos stockinette along the outside of the fuse carrier, so that the fuse carrier can then be inserted in the fuse in such a manner as to ensure that the fuse wire will not contact the casing.

In the case of cartridge fuses with the fuse-element passed through the threaded hole for the holding stud, renew the fuse-element by inserting the fuse wire inside the cartridge, where practicable.

The number of strands of fuse wire to correspond to the ratings of fuses is set out in Section No. 10. Item No. 16 "Ceramic Bridge Service Fuses".

When temporary supply has been given by means of bridging fuses at a customer's main control, leave a "Further Work" Card referring the customer to an electrical contractor for replacement or repair of the fuses.

ITEM NO. 6 MINOR DEFECTS.

Emergency Service Officers are expected to adjust minor defects such as loose screws, cleaning of contacts, etc.

ITEM NO. 7 METER LEADS.

Where open wiring between the service fuses and the meter, or between the meter and the customer's switchboard is defective or of insufficient length, renew the wiring if it is readily accessible and if there is no sweated connection and the length of wire is not more than a few feet.

If renewal cannot be carried out, refer the customer to an electrical contractor for renewal of the meter leads.

Replacement wire is 7/0.036 V.I.R.

ITEM NO. 8 CUSTOMERS' APPARATUS UNDER SEAL.

Customers' fuses and connection boxes giving access to unmetered supply must be securely sealed unless repair work is to be done, when they may

Customers'
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be left unsealed until the repairs are effected.

Reference must be made in Service Reports when customers' apparatus normally under Seal is left unsealed.

Upon receipt of advice that the repairs have been completed, the work shall be checked by an Emergency Service Officer and if the work has been done satisfactorily, reseal and report accordingly. The Record Card shall then be filed.

ITEM NO.9 NEW WORK.

New work which has not been passed by the Chief Installation Inspector must not be connected by officers of the System Operation Branch.

If an installation consists partly of old wiring and partly of new wiring, supply shall be given to the old portion if the new wiring can be isolated.

If the new wiring cannot be isolated supply must be left disconnected unless instructions to the contrary are issued by the Chief Installation Inspector or the Operating Engineer.

When supply is left disconnected under these circumstances, the customer shall be advised to communicate with the Chief Installation Inspector and the Despatch Officer must be notified immediately.

The Supervisor Installation Inspectors shall be notified without delay during general working hours. In the case of reports received after general working hours, the Supervisor Installation Inspectors shall be notified at 9.00 a.m. on the next general working day.

ITEM NO.10 CUSTOMERS' FUSES UNDER SEAL AT POINT OF ATTACHMENT.

When customers' fuses under seal are found at the point of attachment and on the line side of service fuses, permanently bridge out the fuses by means of a suitable link or fuse wire and reseal the fuses.

Do not confuse customers' fuses at point of attachment with those on extended customers' mains.

ITEM NO.11 FAULT ON INSULATION OF NEUTRAL CONDUCTOR.

The practice of reversing the faulty circuit conductor at the switch-board, in the case of a fault on the neutral conductor, and blowing the fault clear by applying the voltage to the circuit, is not permitted.

This practice may lead to heavy damage against the Sydney County Council because of a fire which might originate at the fault.

ITEM NO. 10 (CONTD.)

Do not confuse customers' fuses at point of attachment with those on extended customers' mains.

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The practice of reversing the faulty circuit conductor at the switchboard, in the case of a fault on the neutral conductor, and blowing the fault clear by applying the voltage to the circuit, is not permitted.

This practice may lead to heavy damage against the Sydney County Council because of a fire which might originate at the fault.

ITEM NO. 12 DAMAGE BY FIRE

If an installation has been damaged by fire so severely as to be dangerous, officers shall draw the service fuse-links or disconnect at the point of attachment, if necessary, to render safe, and report immediately to the Despatch Officer who shall take any action that may be required. See also Item No. 37 covering Fires.

ITEM NO. 13. REQUESTS FOR SERVICE RECEIVED BY EMERGENCY SERVICE OFFICERS DIRECT FROM CUSTOMERS.

It is necessary for the Despatch Officer to be kept informed of the movements of Emergency Service Officers and such information shall be provided as often as practicable so that the despatch of work can be organised to provide a prompt service for the needs of customers.

Any officers approached direct by customers with a request to restore the electric supply or to rectify some defect on the electric installation at their premises shall observe the following procedure in order that the Despatch Officer shall be advised of their movements and to avoid an unnecessary visit by another officer should the request for service have already been received at Head Office:-

- (a) Whenever practicable, refer to the Despatch Officer before doing direct jobs. Where this is not practicable, report particulars to the Despatch Officer immediately on completion and before proceeding to deal with any other relatively less important urgent work in hand.
- (2) If attending or about to attend more urgent work when approached directly by a customer requesting service, record the customer's name and address and politely promise the customer that the desired service will be carried out as soon as possible. Report details to the Despatch Officer at the first opportunity.
- (3) Where visits are made without prior reference to the Despatch Officer, mark the Service Report "Received Direct."

ITEM NO. 14. DISCONNECTION FOR AND RECONNECTION AFTER REPAIRS.

(i) Disconnection.

Emergency Service Officers visiting premises by appointment to disconnect supply for repairs shall obtain confirmation of the appointed time for disconnection from the customer before disconnecting.

When an Emergency Service Officer has disconnected the whole or portion of an installation for repairs because of defects found or by appointment, he must notify the Despatch Officer immediately after leaving the premises.

Customers'
Installations.

ITEM NO. 14. (CONT'D.)

(ii) Reconnection

"Line clear" must be obtained from the customer or his representative before reconnecting after repairs.

Emergency Service Officers shall examine the installation and check and report that the work actually done is according to the summary given by the Despatch Officer. Should the Emergency Service Officer notice that any additional work has been done or if he is of the opinion that any other work should have been done, details shall be recorded in the Service Report.

(iii) Meter Readings

Meter numbers and readings must be shown on Service Reports for all cases of total disconnection or reconnection.

(iv) Charges

No charge is made for disconnection for or reconnection for the purpose of overhaul or repair of customers' installations.

ITEM NO. 15. PROPERTY OWNED BY THE MUNICIPAL COUNCIL OF SYDNEY

When defects are discovered in the installations in property owned by the Municipal Council of Sydney and these defects would in ordinary circumstances be referred to a Contractor, Emergency Service Officers shall not refer to a Contractor while at the premises. In these cases, Emergency Service Officers shall show clearly on Service Reports that the premises are owned by the Municipal Council of Sydney

Despatch Officers shall ensure that the Municipal Council of Sydney is notified of the defects promptly.

Reports of defects requiring urgent attention must be telephoned to the Despatch Officer for the necessary action immediately they are discovered.

ITEM NO.16. SEALING OF IDLE MOTORS (CONTD).

Customers arrange with the Chief Installation Inspector for the reconnection of motors and the removal of seals for the purpose of transferring load from one motor to another or to place an idle motor in service again or to give a standby motor a trial.

When seals are removed from motors complete details of the motors must be entered on the Service Reports for the information of the Chief Installation Inspector (C.I.I.).

ITEM NO.17. CHARGES MADE BY ELECTRICAL CONTRACTORS FOR WORK DONE BY THE SYDNEY COUNTY COUNCIL.

It is possible that a customer whose electric supply has failed may call upon the services of an Electrical Contractor. The Contractor may telephone the Sydney County Council without first visiting the premises and as a result an Emergency Service Officer will visit the premises and replace defective fuses.

Full particulars of any such cases discovered must be reported for the information of the Operating Engineer.

ITEM NO.18. RECOMMENDING ELECTRICAL CONTRACTORS TO CUSTOMERS.

Customers on request, shall be supplied with the names, addresses and telephone numbers of not less than three electrical contractors from the list supplied to Officers and shown as operating in or adjacent to their particular locality.

Officers shall confine themselves to supplying the abovementioned details. They shall not express an opinion to a customer regarding the merits of any electrical contractor or electrician nor shall they criticise approved control gear or apparatus.

ITEM NO.19. DISCUSSIONS CONCERNING CUSTOMERS' INSTALLATIONS.

Officers shall not discuss any customer's electrical installation with an electrical contractor who has not been engaged by the customer.

Discussions with the appropriate electrical contractor should be conducted preferably in the presence or at the request of the customer.

ITEM NO.20. UNAUTHORISED SUPPLY.

If, during the course of duty, a suspected unauthorised connection is encountered, the occupant of the premises must not be informed.

Report shall be made immediately to the Despatch Officer who shall arrange for two (2) Emergency Service Officers to inspect and report the circumstances.

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ITEM NO. 20 UNAUTHORISED SUPPLY CONTD.

When an unauthorised connection is suspected before a visit is made, two (2) Emergency Service Officers shall be sent to the premises.

One Emergency Service Officer shall report the circumstances discovered and the other shall act as a witness to corroborate the statements of the first.

ITEM NO. 21. DEFECTS ON ADJACENT PREMISES.

Officers while attending one customer may notice potentially dangerous defects on electrical equipment of adjoining premises.

Particulars of these cases must be reported but the customer shall not be referred to a contractor unless the defects are immediately dangerous in which case officers are expected to take the appropriate steps for the removal of the hazard.

Despatch Officers shall, on receipt of these reports, make out a Record Card addressed for delivery to the appropriate Branch and showing whether or not the customer has been referred to a contractor.

ITEM NO. 22. CONNECTION OF TEMPORARY ADDITIONAL APPARATUS.

It may be necessary in emergency to connect additional apparatus temporarily to a customer's installation.

The Maximum Demand Indicator (if any) must be bridged out before connecting the additional load.

The usual routine governing the reporting of bridged Maximum Demand Indicators must be followed.

ITEM NO. 23. REPEATED VISITS TO CUSTOMERS' PREMISES.

When a customer advises an Emergency Service Officer that repeated visits to the premises have been necessary for the same cause in each case, or where an Emergency Service Officer knowingly visits a customer's premises repeatedly because of the same defect, the circumstances must be indicated on a Service Report.

Despatch Officers shall refer Record Cards and Service Reports in these instances to the Emergency Service Supervisor.

ITEM NO. 24. D.C./A.C. INDICATOR.

A D.C./A.C. indicator is available as required by any officer to determine the type of supply at certain locations in City buildings.

ITEM NO. 25. INDUSTRIAL LIGHTING ADVISORY SERVICE (CONT'D.)

Customers telephoning after hours or enquiring of Emergency Service Officers shall be informed that arrangements will be made for an officer of the Electricity Development Branch to interview the customer and give the desired information. The customer's name and address and other relevant matter shall be recorded and a Service Request Card showing these particulars shall be addressed to the Industrial Lighting Section of the Electricity Development Branch (E.D.S./Industrial Lighting).

ITEM NO. 27. "IRON LUNGS" AND ELECTRICALLY OPERATED RESPIRATORS

"Iron Lungs" and other breathing apparatus for the treatment of persons suffering from serious respiratory disability or for the resuscitation of the apparently dead are installed at the major hospitals and are also in use at several private residences.

An interruption to the electric supply of even only a few minutes' duration could prove fatal to a patient dependent on electrically operated breathing apparatus for survival; consequently all calls for service to this class of apparatus must be regarded as being of extreme urgency.

The following list of customers have one of these types of apparatus in use at their residences:-

Mrs. G.R. Campbell	2 Gordon Crescent, Eastwood	85 2910
Mr. McGrath	43 New South Head Rd., Vaucluse	337 4700
Miss Powell	23 Maryl Ave., Lakemba	759 9226
Mrs. J. Shannon	7 Hyacinth St., Asquith	
Mr. T. Tatham	38A Holmes St., Turramurra	449 3274
Miss W. Stuart	Fl.76, 522 Malabar Rd., Maroubra	34 5503

ITEM NO. 28. INSTRUCTION CARDS FOR CUSTOMERSTYPES OF CARDS

Instruction Cards, which Emergency Service Officers may leave at customers' premises, are of nine (9) types:

(a) N.O. 1560 "Further Work" - Printed on white card.

Left when necessary to refer a customer to a contractor for repair work.

ITEM NO. 28. INSTRUCTION CARDS FOR CUSTOMERS (CONT'D.)

- (b) N.O. 1565 "Apparatus Service" - Printed on pink card.

Left when necessary to refer a customer to the Apparatus Service Section for an appointment for repairs to apparatus.

- (c) N.O. 1570 "Switch Open" - Printed on green card.

Left when supply has been restored but it has been necessary to leave the main switch open. It gives the customer directions for closing the main switch.

- (d) N.O. 1575 "No Admittance" (generally referred to as "No Access" Card) - Printed on yellow card.

Left when admittance to premises cannot be gained and requests the customer to arrange another appointment.

- (e) N.O. 1588 "Report of Electric Shock" - Printed on blue card.

Left when unable to gain admittance to check report of electric shock; to advise customer that supply has been isolated and the action to be taken by the customer.

- (f) N.O. 1760 "Supply Found Connected" Card.

To be used on reconnect new customer (Code 4) jobs when supply is found connected. Attach card to point of disconnection at meter or service fuse, to advise Special Meter Reader when he calls later in the day that he is not to disconnect the supply.

- (g) N.O. 1770 "Warning - Disconnection" Label - Red printing on green label.

Attached and sealed to dangerous electrical appliances or those suspected but not proven to be dangerous. To be removed only by qualified serviceman.

Attached to any fuses drawn by an Emergency Service Officer for the purpose of isolating the whole or any portion of the customer's installation.

- (h) N.M. 1330 "Temporary Supply" - Printed on white card.

Left when customers' service wiring is disconnected for defects - informs customer of conditions under which a temporary connection can be made.

ITEM NO. 28. INSTRUCTION CARDS FOR CUSTOMERS (CONT'D.)(i) M.E. 145A "Free Temporary Supply" Card.

Left when customer's service wiring is disconnected for defects and it is considered that the existing service construction either Point of Attachment or position of board is unsatisfactory. To inform customer that a free temporary supply pending remarking of an unsatisfactory service position has been connected. Customer will be notified by letter concerning the work to be carried out. Pending the receipt of the letter, no action is to be taken by the customer to have any repairs carried out to the affected portion of the installation.

ITEM NO. 29. ADDRESSING OF SERVICE CARDS REFERRING CUSTOMERS TO CONTRACTORS FOR REPAIR WORK(i) Correspondence between Customers and The Sydney County Council

Usually any correspondence concerning the electrical installation at premises is addressed to the customer who has signed the agreement with The Sydney County Council undertaking to pay accounts for electricity consumed at the premises.

Requests for emergency service at customers' premises may be received from the owner, agent, tenant, customer, relative, lodger or other person acting on behalf of any of these parties.

Officers of the System Operation Branch visiting customers' premises to provide emergency service shall interview the person who requested the service, or any other person on the premises at the time of the visit.

(ii) Persons Responsible for Maintenance and Repair Work

Cards which are left at customers' premises, such as those setting out defects which require attention by a licenced electrical contractor, usually are addressed showing the name of the person interviewed at the time of the visit.

From time to time, confusion arises in the case of rented or leased premises as to who is responsible for the maintenance and repair of the electrical installation. Sometimes the agent deals exclusively with maintenance and repair work on behalf of the owner; in other cases, the agent collects rentals only and repair work must be referred to the owner. Again, the terms of a lease may require the lessee to be responsible for maintenance and repair. On occasions, the customer is in doubt as to whether the owner, agent or customer is responsible.

ITEM NO. 29. ADDRESSING OF SERVICE CARDS REFERRING CUSTOMERS TO CONTRACTORS FOR REPAIR WORK (CONT'D.)

(ii) Persons Responsible for Maintenance and Repair Work (Cont'd.)

Accordingly, officers of the System Operation Branch must not make a definite statement to the customer that the owner, agent or any particular person is responsible for the maintenance or repair of the electrical installation - they shall advise the customer to make any such enquiries from the person who usually collects the rent for the premises.

(iii) Addressing of Service Cards by Officers

Officers of the System Operation Branch when leaving cards setting out details of repair work necessary, or other notices referring to the electric supply, shall address such cards or other notices to show the name of the person whom they have interviewed, together with the postal address of the premises.

Should any correspondence with the customer become necessary following on the report of the action taken by an officer of the System Operation Branch, such correspondence usually is addressed to the person who signed the agreement to be responsible for the payment of the electricity supply accounts.

ITEM NO. 30. LABELLING OF DEFECTIVE CIRCUITS OR APPARATUS

(i) Type of Label Used

There is only one label to be used when it is necessary to isolate dangerous defects found on customers' installations. This is the Warning "Disconnection" Label (OE 75) N.O. 1770 - To be attached when it is necessary to prevent the use of seriously defective portable appliances or pieces of apparatus and to be used when disconnecting circuits or any portion of an installation in order to isolate dangerous defects.

(ii) Details to be Shown on Label

Before attaching a Warning "Disconnection" label, the entry on the label must be completed in all details, which includes the name and address of customer, date of disconnection, reason for disconnection, including a brief summary of defects, and the signature of the officer attaching the label. The alternate wording must also be struck out so that the label reads "Appliance" and "authorised serviceman" or "Wiring" and "Licenced Electrician" as appropriate.

ITEM NO. 30. LABELLING OF DEFECTIVE CIRCUITS OR APPARATUS (CONT'D.)(iii) Labelling of Circuits or Sub-Circuits

Where it is necessary to isolate defects by removing fuses protecting a circuit, the fuses must be tied to the customer's switchboard and labelled with a N.O. 1770 Warning "Disconnection" label fixed to the fuses by means of a sealing wire threaded through a seal and twisted slightly without crimping the seal with sealing pliers.

In these cases Service Reports must be clearly marked to show "Fuses drawn and labelled".

Where a circuit is disconnected by other means than that of drawing fuses, such as by withdrawing conductors from fuses, links, circuit breakers, the ends of the conductors must be taped and the conductors fastened together by sealing wire with a N.O. 1770 Warning "Disconnection" label and seal attached.

If disconnection of portion of an installation is made by withdrawing conductors from terminals or connectors at a junction box, fitting or other similar point the conductors disconnected must be tied together and labelled with a N.O. 1770 Warning "Disconnection" label.

(iv) Isolating Main Switches and Fuses Normally Under Seal

When a customer's main switch has been isolated or a customer's fuses normally under seal have been drawn to remove a hazard, a N.O. 1770 Warning "Disconnection" label shall be attached by a sealing wire threaded through a seal and twisted slightly without using sealing pliers.

ITEM NO. 31. INSPECTION AND TESTING OF SUSPECTED DEFECTIVE INSTALLATIONS1. INSPECTION AND TESTING AT REQUEST OF CUSTOMERSStandard Charges

Customers may at their own request, have their installations inspected and tested by obtaining and completing an application form titled "Special Inspection of Electric Installation" and agreeing to pay the appropriate charges which at the present time are as set out below:

- | | |
|--|--|
| (a) Premises used solely as a single private residence or an individual flat | \$2.50 |
| (b) Premises other than single private residence | \$2.50 per hour with a minimum charge of \$3.25. |

Customers who request that an installation be inspected and tested must be informed of the Standard Charges for the work.

ITEM NO. 31. INSPECTION AND TESTING OF SUSPECTED DEFECTIVE INSTALLATIONS
(CONT'D.)

2. REQUESTS RECEIVED BY OFFICERS ATTENDING CUSTOMERS' PREMISES

After establishing that no hazard exists, the customer shall be advised to contact the Electrical Installation Branch on the next working day or call at the nearest Sydney County Council showroom and obtain and complete Form I. 104 "Special Inspection of Electrical Installation".

3. INSPECTIONS WITHOUT CHARGE RECOMMENDED BY OFFICERS OF THE SYSTEM OPERATION BRANCH

When an officer visiting a customer's premises in response to a request for emergency service suspects the existence of a fault warranting a further inspection by an officer of the Electrical Installation Branch, a recommendation stating the reasons for such recommendation must be included in the officer's report on his Daily Run Sheet.

If the suspected fault is likely to create a hazard, the Despatch Officer - Co-ordination must be notified immediately in accordance with the provision of Branch Standing Instruction No. 3110 "Electric Shock and Associated Fatalities" and the Despatch Officer Co-ordination shall take the necessary action.

ITEM NO. 32. DEFECTS IN CUSTOMER'S INSTALLATION AND APPARATUS.1. Introduction.

Defects noticed by Emergency Service Officers on customers' installations shall be considered under three classes and dealt with accordingly.

The examples indicated in the general classification shown in this instruction should be very closely studied by all officers in order to form a clear basis for the determination of the action to be taken.

2. Extent of Inspection for Defects.

Emergency Service Officers shall deal only with those defects which come under their notice when carrying out their normal duties.

Officers shall not carry their inspections any further than is necessary to complete the work for which they visit premises.

If a customer should ask for further inspection the matter should be referred to the Chief Installation Inspector in accordance with Item No.

31. "Inspection and Testing of Suspected Defective Installations."

3. General Classification of Defects.Class I - Defects which shall not be reported.

- (a) Work defective but not dangerous.
- (b) Work not complying with any recognised standard but not dangerous.
- (c) Work which was previously acceptable but which modern wiring rules would bar.

Defects of this class shall not be reported by Emergency Service Officers.

Class II - Work which is Potentially Dangerous.

This class includes all those conditions, except those covered by Class I (c), which are likely eventually to cause danger, but from which no person is likely to receive shock or injury until some unusual circumstances arise.

Officers must report all defects of this class but they shall not disconnect any portion of an installation merely because of their existence. They shall inform the customer of the defects, pointing out that others may exist and that it will be necessary to have the installation overhauled and put in order by a Licensed Electrical Contractor.

The usual white card O.E.28 ("Further Work") shall be left with the defects clearly stated thereon.

3. General Classification of Defects (Contd.).

Class III - Work which is Immediately Dangerous.

All conditions likely to cause trouble at any moment are included under this class.

Defects of this class must be isolated from the supply immediately, in the manner set out in the later section of this instruction headed "Disconnection of Immediately Dangerous Defects" and the defects must be reported.

4. Allocation of Defects into the Three Classes -

1. Types of Defects.

Defects found by Emergency Service Officers generally will conform to one of the following types; any of these may be either "immediately" dangerous or merely "potentially" dangerous, depending upon the particular circumstances:-

- (a) Exposure of live parts.
- (b) Failure of insulation.
- (c) Damaged insulation.
- (d) Lack of mechanical security or rigidity.
- (e) High resistance of the Earthing System when such a system exists.
- (f) Incorrect arrangement of or inoperable control gear.
- (g) Incorrect use of an installation.

Emergency Service Officers must consider each defect to determine whether it comes under Class I, II or III.

In this connection it must be noted that a defect in a portable appliance must be considered not only in regard to the position in which the apparatus is found, but consideration must also be given to the positions into which the appliance is likely to be taken.

2. Examples.

The exposure of live parts at a broken single pole switch in a situation where no connection to earth is available would not be "immediately" dangerous, as a person touching the live parts could not complete the circuit to earth; therefore, this defect would be dealt with under Class II.

Exposure of live parts in an earthed situation, as at a broken switch in a bathroom, would be "immediately" dangerous and would be dealt with as a defect of Class III.

2. Examples (Contd.).

Exposure of live parts of both active and neutral would be "immediately" dangerous, therefore of Class III.

The particular case of the exposure of live parts on a switchboard erected more than eight feet from the ground in a position unlikely to be approached by anyone other than a person deliberately going to work on the switchboard shall NOT be considered dangerous, hence it shall be regarded as coming under Class I and not reported.

The exposure of live parts at the unshielded pins of a portable appliance such as a toaster, when these are exposed only while the connector is being pushed home, was previously acceptable and so comes under Class I (a) and shall not be reported.

In the same way, the lack of guarding of heating elements of the open type such as those of the ordinary toaster, bar and reflector type radiators, cooking elements, etc. shall be taken as under Class I.

Failure of insulation which results in the energising of metal parts not normally energised must be considered dangerous. If the live metal is in an earthed situation where it is likely to be touched, the defect will come under Class III. If the live metal is unlikely to be touched or a circuit to earth is not available the defect will come under Class II.

Any damage to insulation which has resulted in the exposure of live parts or in the energising of parts not normally energised shall be dealt with as in the preceding paragraph. Damage to insulation which is likely to cause such trouble but has not done so up to the time of the inspection shall be dealt with under Class II. For example, abrasion of cable insulation at a free end of conduit which has not yet resulted in contact of the conduit with live conductors, but which is likely to allow such contact in the future, shall be considered a defect of Class II.

Any lack of mechanical security or rigidity in wiring, accessories, apparatus or the earthing system which would be likely to cause strain on connections or terminals, exposure of live parts, failure of insulation, interruption of the earthing conductor, or continuity of conduits must be considered dangerous. If exposure of live parts or energising of exposed metal has not resulted up to the time of the inspection, the defect will be of Class II. If such defect has already arisen from the lack of mechanical rigidity the defect shall be considered as coming under Class III, in accordance with the foregoing examples.

High resistance of the earthing system in an installation otherwise in order will be dangerous only in the event of another defect occurring and will therefore be of Class II.

2. Examples (Contd).

In this connection attention is drawn particularly to badly installed washing machines and wash boilers. These are often not correctly earthed. If the machine is defective, the whole matter comes under Class III. If the machine itself is in good order, the inadequate earthing or bad installation would come under Class II.

The incorrect use of an installation in a manner which will cause danger must be dealt with under Class II or III, as necessary - for example, the use in a metal container, such as a saucepan, of an open type element designed for use in an insulated container such as a jug, must be considered dangerous.

Similar principles to those set out at length in the foregoing examples, are illustrated by lists of defects arranged under the three class headings in the appendix attached.

5. Disconnection of Immediately Dangerous Defects.

When it is found that an installation or any portion of an installation is in an immediately dangerous condition and where it is not possible to remove the dangerous condition in some very simple manner such as taping up exposed live parts, etc., the immediately dangerous portion of the installation must be disconnected from the supply.

The customer or his responsible representative must be informed of the proposed action before the disconnection is made and regret expressed at the necessity for the disconnection. It must be demonstrated that there is no alternative to taking this action in view of the nature of the defects, that is to say, that the disconnection is an essential safety precaution and is being made in the customer's interest. The customer shall also be told that if communication is made with the Sydney County Council as soon as the dangerous faults have been removed, the installation will be checked as soon as possible and re-connected, if in order.

In carrying out the disconnection, the Emergency Service Officer shall leave connected as much of the customer's installation as is possible by first trying to isolate only the dangerous section, either by disconnection at a junction box or at a fitting or other point where the disconnection can be done easily, care being taken to label any wiring so disconnected. If it is not possible to disconnect in this way, the dangerous work shall be isolated by withdrawing the fuse-links protecting the final sub-circuit or part of the installation. In such cases a label must be attached to the fuse-links sealed out. Only as a last resort will the whole installation be disconnected.

5. Disconnection of Immediately Dangerous Defects, Contd.

If possible, the disconnection shall be made in such a way that the defective portion is left clear of the section remaining connected.

The usual white card ^{NO 1360} ~~XXXX~~ ("Further Work") shall be left with the defects clearly stated thereon.

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APPENDIX.

EXAMPLES OF DEFECTS LISTED UNDER THE THREE CLASS HEADINGS.

NOTE. The list is not intended to be ~~complete~~ ^{0.21 on} but merely to be a set of examples.

CLASS I. DEFECTS WHICH EMERGENCY SERVICE OFFICERS WILL NOT REPORT.

(a) Work defective but not dangerous.

An open circuit in wiring with no other complication.

Internal open circuit in an appliance (Report if attention is required by Electricity Sales Supt.)

Fuses incomplete exposing "live conductors on a switchboard more than eight feet from the floor.

Switchboard not adequately labelled.

A switch other than the main switch or a socket control switch inoperative (Report if attention is required by Electricity Sales Supt.)

(b) Work which does not comply with any recognised standard but which is not dangerous.

Conductors not protected by conduit of the correct size.

Flexible conductors used for fixed wiring but not run above ceiling or beneath floor nor in any other place where they would be liable to be neglected and allowed to deteriorate for long periods.

The connection of a large number of points in parallel to the one circuit without actually overloading the conductors.

The use of multiple connectors without overloading.

The use of conductors of a smaller gauge than that required by the Wiring Rules, these conductors being, in fact, not overloaded.

Conduit ends not bushed - cable insulation not damaged.

Open wiring not exposed to mechanical injury.

- (c) Work which was previously acceptable but which modern Wiring Rules would bar.

Exposed metal not earthed in an installation not equipped with an earthing system.

The metal cover of a tumbler switch not effectively earthed.

Flexible conductors in good condition but fixed in position through a partition or doorway.

Flexible conductors in good condition used in a place for which another type of flexible conductor is specified.

Two pin socket outlet in an earthed situation.

Switches controlling the neutral instead of the active in cases other than socket outlets.

CLASS II. DEFECTS AND CONDITIONS WHICH MUST BE CONSIDERED POTENTIALLY DANGEROUS AND THEREFORE REPORTED (ON THE USUAL REPORT FORM) FOR FURTHER ACTION BY THE CHIEF INSTALLATION INSPECTOR.

A socket control switch on the neutral conductor instead of the active.

A socket without a local control switch (No objection to one switch controlling more than one adjacent socket, provided switch is not, in fact, overloaded.

Switches insouciously fixed.

Main switch defective - installation not under control.

Fuses bridged.

Fuses incomplete, exposing "live" conductors on a switchboard within eight feet of a floor but not in a position likely to be accidentally touched..

Conductors disconnected from the supply not clear of the installation remaining connected. (Disused wiring must not be left in association with wiring still in use).

Aerial conductors not adequately supported.

A joint in a cable not protected by an approved junction box and in a position where failure of the joint insulation may energise exposed metal or otherwise cause shock.

The insulation resistance between conductors or between earth and conductors low.

CLASS II CONTD.

Conductors actually exposed to mechanical injury and not adequately protected.

Lead covered conductors not adequately supported.

Conductors seriously overloaded showing signs of overheating and destruction of insulation.

Flexible conductors exposed to the weather.

The earthing conductor not continuous.

An earthing clip not gripping the conduit of pipe securely.

An earthing clip not of the correct size, resulting in a high resistance contact.

The core, frame or secondary wiring of a bell-ringing or other extra low voltage transformer not effectively earthed.

Earthing terminal of a socket outlet which is in an earthed situation and is not earthed but is part of an installation provided with an earthing system.

The earthing conductor of a portable appliance not included in the flexible cord.

A grip fitting incomplete, thus creating a high resistance in the conduit circuit.

Conduit insecurely fixed.

Conduit ends not bushed - cable insulation damaged.

Improvised portable hand lamp, consisting of a length of flexible cord and an insulated lampholder without a handle and the lamp guard.

CLASS III. DEFECTIVE WORK OR CONDITIONS WHICH ARE IMMEDIATELY DANGEROUS AND THEREFORE TO BE DISCONNECTED BY EMERGENCY SERVICE OFFICERS.

A switch or socket outlet or other gear incomplete, exposing "live" conductors in an earthed situation.

An incomplete accessory or appliance in any situation exposing both neutral and active conductors.

Conduit, earthing conductor or other exposed metal, energised by the failure of insulation.

CLASS III CONTD.

A home-made portable lead including an unprotected brass lampholder.

Any home made apparatus used in an earthed situation so constructed that failure of insulation and energising of exposed metal is very likely.

ITEM NO. 33. TEST OF EARTHING OF CUSTOMERS' INSTALLATIONS.

1. SYSTEMS OF EARTHING - DEFINITIONS.

In the Sydney County Council Supply Area the following systems of earthing may be encountered:

(a) Direct Earthing System.

A system of earthing in which the parts of an installation, required under the S.A.A. Wiring Rules to be effectively earthed are so earthed, but are not connected within the installation to the neutral conductor of the supply system or to earth through the trip coil of an earth leakage circuit breaker.

(b) Earth Leakage Circuit Breaker (E.L.C.B.) System.

A system of earthing in which the parts of an installation, required under the S.A.A. Wiring Rules to be effectively earthed, are directly earthed, and in addition are earthed through one or more earth leakage circuit breakers or relays.

(c) Multiple Earthed Neutral (M.E.N.) System.

A system of earthing in which the parts of an installation, required under the S.A.A. Wiring Rules to be effectively earthed, are so earthed and, in addition, are connected within the installation to the neutral conductor of the supply system.

The areas supplied by the Sydney County Council where the M.E.N. System of earthing is in use are the Sutherland Shire, the Bankstown Municipality, parts of Eastwood in the Ryde Municipality and parts of the Hornsby Area.

2. TESTING CONTINUITY OF EARTH CONNECTIONS AND INSULATION OF CONDUCTORS.

When working on customers' switchboards and there is a doubt concerning the effectiveness of the customer's earth connections officers shall test the continuity of the earth connections and the insulation of conductors of the customer's wiring.

2.1 Method of Testing - Direct Earthing System.

Supply must be disconnected during the earth continuity and insulation of wiring tests. If supply is not disconnected during these tests misleading results would be obtained in cases where the earthing is ineffective, and the insulation resistance of the wiring is also defective.

ITEM NO. 33 CONTD.2. TESTING CONTINUITY OF EARTH CONNECTIONS AND INSULATION OF CONDUCTORS
CONTD.

To disconnect supply in cases where there is no conduit between the service fuses and the customer's switchboard, open-circuit all conductors either by opening the main switch or removing all the customer's fuse-links and closing the main switch. In either case the neutral link shall also be removed.

When there is conduit between the service fuses and the customer's switchboard, remove the service fuse-links and the service neutral link and close the main switch, leaving the customer's fuses intact.

Where there are several customers connected to the same service fuses, to test an individual installation remove both active and neutral load side connections from the energy meter leaving customer's main switch closed and all fuses intact.

To test the earthing continuity, test with lamps between the line active at the point at which the supply is disconnected and all conduits and earth conductors within reach. If earthing is in order a full 240 volt glow will be obtained.

To test the insulation resistance to earth proceed as follows:

(a) When the earthing is effective.

Test with lamps between the line active at the point of disconnection and all conductors, active and neutral, that have been disconnected. A "light" in the test lamps will indicate that the insulation resistance of the conductor being tested is defective.

(b) When the earthing is not effective.

When the earthing is not effective an extremely dangerous condition will exist if the insulation of a conductor fails. To test when the earthing is not effective, that the insulations of the various conductors are sound, supply shall be restored to the customer's wiring and the following tests applied: (over page)

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TESTS WITH LAMPS BETWEEN	A GLOW IN TEST LAMPS INDICATES	
	SINGLE PHASE INSTALLATION.	MULTI-PHASE INSTALLATION
(a) Conduits and Waterpipes	The insulation of the active conductor has failed.	The insulation of an active conductor has failed (however, if all appliances and appar- atus have not been turned off the failure of the insulation of the neutral conductor could also cause a glow in the test lamps).
(b) Actives and Conduits.	The insulation of the neutral conductor has failed.	The insulation of the neutral or another active has failed (depending on the brilliance of the glow).
(c) Neutral and Conduits	The insulation of the active conductor has failed.	The insulation of an active conductor has failed.

2.2. Testing Earthing Systems Where Earth Leakage Circuit Breakers are In-
stalled.

When earth leakage circuit breakers are found on customers' premises and it is considered necessary to check the effectiveness of the earthing system, such tests may be made by testing between the active terminal and the earthing electrode connection at the circuit breaker and also between the active terminal and the solid earthing connection at the circuit breaker, and then the usual test between the active terminal and the conduit or other portion of the installation to be protected. Then by arrangement with the customer, the earth leakage circuit breaker may be tested for tripping by operation of the test button. If the customer will now allow the electric supply to be interrupted at the time of the visit, this tripping test shall be omitted.

2.3. Testing with the M.E.N. System.

To test the insulation resistance of the conductors with the test lamps, first open the main switch, remove the incoming neutral connection and the direct earthing conductor from the main neutral link, apply the test

2.3. Testing with the M.E.N. System. Contd.

lamps in turn across each phase of the main switch, and between the line side of each phase of the main switch and the neutral link. A "light" in the test lamps will indicate that the circuit concerned is faulty.

To test that the installation is effectively earthed, remove the incoming neutral connection from the neutral link and with the main switch open, apply the test lamps between an active terminal and the neutral link or a clean section of the earth conductor.

A full 240 volt glow should be obtained.

3. DEFECTS IN EARTHING SYSTEM OR INSULATION OF WIRING.

If the insulation of the wiring is sound but the conduits are not effectively earthed, supply shall be left connected provided that the Control and protective equipment is in order, excepting when the customer reports having received a "shock" the cause of which cannot be ascertained and corrected, in which case action shall be taken in accordance with the relevant Branch Standing Instruction.

If the insulation of a conductor has failed and the conduits are not effectively earthed, isolate and label the defective sub-circuit. If only one circuit exists, disconnect and seal out supply.

The procedure outlined above is intended to cover general cases. If, however, an officer is called upon to attend at a customer's premises and cannot ascertain either by inspection or explanation given by the customer, the cause of fuses being blown he will request the customer to turn on all switches and then carry out tests with lamps.

If the insulation has failed on the conductor between a switch and a lamp holder only, and the earthing system is effective, take out the lamp and, if possible, tape up the wall switch, or tie out of reach the cord of the ceiling switch, warn the customer not to replace the lamp or operate the switch until the wiring has been repaired by a contractor and leave supply connected.

4. INTERFERENCE WITH EARTH CONNECTIONS BY PLUMBERS.

Plumbers working at customers' premises frequently leave the earth connection to the water pipes disconnected or connected ineffectively. To overcome this the Electricity Authority of New South Wales has circularised all plumbers informing them of the danger of this practice. Emergency Service Officers shall report cases where they find that plumbers have not replaced earth connections after repairs or renewals of water services, including details of the plumber's name and address if obtainable.

Despatch Officers shall refer these cases to the Chief Installation Inspector (C.I.I.) for attention.

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Installations.

ITEM NO. 34. CAPACITORS.

1. General.

Some customers have installed power factor correcting apparatus at their premises. A suitably designed capacitor (static condenser) may be used for this purpose and may be connected to the installation as follows:-

- (a) At individual motors or other low lagging power factor apparatus.
- (b) At local control centres.
- (d) At main control centre.

2. Operation of Capacitors.

Great care must be exercised in handling apparatus to which a capacitor is connected.

The capacitor may be a complete unit or it may be divided into sections which may be placed in or out of service according to the amount of power factor correction that may be required from time to time.

In the case of individual connections to motors, the motors act as permanently connected discharge resistors.

In cases of local control and main control centres, the capacitors are provided with permanently connected discharge resistors or auxiliary discharge which come into circuit when supply is disconnected from the capacitor.

The discharge resistors are necessary because when the capacitor is open circuited from the supply, there is occasioned a high voltage which may be of great magnitude, dependent on various factors.

When supply is disconnected, the capacitor is discharged through the resistors, thus preventing damage to apparatus in circuit with the capacitor.

It therefore follows that, should a fault develop in the discharge circuit, the capacitor may be left in a charged condition and is likely to remain so for some considerable time, dependent upon the rating and insulation value of the capacitor.

3. Routine to be Followed When Working on Capacitors.

For the reason outlined above and to prevent injury to the operator, the capacitor must first be disconnected by normal operation of the switchgear in the circuit, before commencing work on the circuit.

Should it be necessary to work upon the capacitor control switch or on the capacitor itself, together with the discharge resistors, the capacitor terminals must first be shorted and earthed by connecting a 20 gauge fuse wire firstly to earth and then to each of the capacitor terminals in turn. This wire is to be left in position until all repairs are effected and then removed by disconnecting at the capacitor first and the earth connection last.

ITEM NO. 35. FLUORESCENT LIGHTING.

Emergency Service Officers will in the course of their duties meet increasing numbers of fluorescent lighting installations and will require to know the types, method of operation, auxiliary equipment used and be able to diagnose the main faults which are peculiar to this type of lighting.

In this advice sheet broad details will be given of:

- (1) Principle of operation of fluorescent tubes.
- (2) Types of fluorescent tubes.
 - (a) Cold cathode.
 - (b) Hot cathode.
- (3) Control of fluorescent lamps.
- (4) Operation of fluorescent lamps.
- (5) The starting switch.
- (6) Instant start circuits.
- (7) Comparison of fluorescent lamps with Incandescent lamps.
- (8) Service defects.
- (9) Characteristics of Hot and Cold cathode lamps.

1. PRINCIPLE OF OPERATION.

Fluorescent lamps consist of glass tubes whose inner surface is coated with a fluorescent powder and in which electrodes are fitted at each end of the tube. Mercury vapour and argon gas at very low pressure are sealed within the tube.

Customers' Installations.

When a voltage is applied across these electrodes a state of excitation is set up in the gas, in which collisions between the particles of gas take place. These collisions result in the liberation of energy in the form of light. The discharge occurs at a very low pressure of mercury resulting in the production of ultra-violet radiation which activates the specially chosen combination of fluorescent powders on the inner surface of the glass tube.

Actually only about 15% of the light from the discharge itself reaches the eye as visible light, the other 85% coming from the fluorescent coating which might be termed a "secondary radiation".

2. TYPES OF FLUORESCENT LAMPS.

There are two types of fluorescent lamps:- "hot cathode" and "cold cathode".

Actually the term "hot cathode" is short for "hot starting cathode" and "cold cathode" is short for "cold starting cathode", (in the running condition the cathode for the latter lamp is anything but cold!) Another point to be borne in mind is that, though the electrodes are usually referred to as "cathodes", actually they act alternately as anodes and cathodes, changing their function every half cycle when the lamp current reverses.

The Operation of the two types of fluorescent lamps is as follows:

(a) Cold Cathode Type.

As the name implies the electron emitting electrodes in this type of tube are not heated except by the operation of the lamp. The arrangement of the electrode is illustrated in Figure 1. High voltage of the order of 5000-15,000 (depending on the tube length and diameter) are used to strike the tube and maintain the discharge. High voltage fluorescent tubing has been developed from the simple discharge tubes originally chiefly used for signs.

The voltage required to "strike" the tube is about four times that required to maintain the discharge. Once alight the electrodes are kept sufficiently warm for operation at the potential applied from the transformer. The transformer is designed with a high reactance so that the terminal voltage of the transformer drops to the required value when current is passing through the lamp.

The transformers are made with a primary and secondary separately wound and assembled on different sections of the iron core. Magnetic leakage is introduced to increase the transformer reactance.

(a) Cold Cathode Type Contd.

A condenser is normally connected across the 240 volt input to the transformer to correct the power factor.

In some cases lamps are connected on the end of H.T. to system neutral through a condenser.

A typical circuit diagram for a cold cathode tube assembly is shown in Figure 2. The arrangement of windings and magnetic leakage paths on the transformer supplying the tubes is also shown.

(b) Hot Cathode Type.

In this type of tube the electrodes are wound into the form of tungsten filaments coated with an electron emissive material. In addition two anodes are provided one at each end of the wound tungsten cathode. The arrangement of the complete electrode for hot cathode operation is shown in Figure 3. The filaments at each end of the lamp are heated only during the starting period.

3. CONTROL OF FLUORESCENT LAMPS.

A gaseous arc discharge is unstable, therefore, some type of control gear is necessary to operate a fluorescent tube. A tube connected directly to the mains would "run away" - drawing an ever increasing current until finally the fuses, or the lamp blew. This condition is corrected by including a suitable inductance (the ballast) in the circuit, which makes the lamp run stably at its designed current and voltage. The ballast may consist of:-

(a) Reactance Choke

This may consist of simply a high reactance choke coil with an iron core (Figure 4) or it may be a small auto transformer with a high reactance (Figure 6). As a choke it is connected in series with the lamp supply and limits the current to the required value for the proper operation of the lamp. As an auto transformer, the primary is across the mains with the secondary feeding to the lamp.

The auxiliary equipment is normally housed in a box which is constructed as a detachable part of the reflector.

(b) Tungsten Ballast Lamp.

The characteristics of Tungsten filament lamps enable them to be utilised for controlling the current of a discharge lamp instead of the choke and this principle has been adopted in a number of fluorescent lamp circuits of the instant start type. Not only is the choke dispensed with but the high power factor of the circuit renders the power factor capacitor unnecessary.

(b) Tungsten Ballast Lamp, Contd.

Light from a tungsten ballast lamp gives a pleasing mixture of incandescent and fluorescent light, but the lumen efficiency is reduced to slightly over half that obtained with a choke ballast. Also, while no starter replacements are required it is usually necessary to replace the tungsten ballast at the same time as the fluorescent lamp. Capital cost is however, less than when a choke ballast is used.

4. OPERATION OF FLUORESCENT LAMPS.

(a) Cold Cathode Tubes.

Mention has been made above of the type of transformer used in cold cathode tube operation. In large transformers the secondary may be made up in two separate coils each mounted on a separate leg of the iron core and one each side of the primary winding. One side of each secondary may be connected as though to form a centre tap which is bonded to a common earth. This simplifies the wiring to a number of tubes saving in high voltage cable and serves to keep down the voltage required for long runs of tubes operated from one transformer.

(b) Hot Cathode Tubes.

In the "hot cathode" fluorescent lamp the electrodes take the form of coiled filaments coated with the necessary activated material. Before the arc is struck, these are heated by passing a current through them. It is this process which introduces most of the complication into circuits for these lamps. The two principal methods are the conventional glow or thermal type starter switch methods and the newer "quick start" method.

When the 240 volt supply switch is closed current flows through the ballast (choke), the automatic starting switch, (glow type or bimetallic strip type) which is closed, and the lamp electrodes, heating them to a suitable operating temperature. After a short period the automatic starting switch opens, interrupting the current in the entire circuit.

This sudden interruption gives rise to a high induced voltage in the choke and this voltage which, it will be seen, is applied across the ends of the lamp, is sufficient to start a discharge from end to end of the lamp. Once this discharge is started, the normal mains voltage is sufficient to maintain it.

5. THE STARTING SWITCH.

The functions of a starting switch are two-fold:

- (1) to complete the circuit so that the lamp electrodes may be heated to operating temperature before the discharge is struck;

5. THE STARTING SWITCH, CONTD.

- (2) to interrupt the circuit after a predetermined time so that a voltage sufficiently high to start the discharge is struck in the choke.

The automatic starter switches in use in this country are of two types:

- (a) Glow type
- (b) Thermal type.

- (a) Glow Type Starter.

This is a compact switch contained in a small glass tube and housed in an outer plastic or metal case. The construction is illustrated in Figure 2. Usually included in the case is a small condenser connected across the switch. The function of this condenser is to eliminate radio interference.

The switch inside the small sealed glass tube is made up as follows:-

One lead goes to a post type contact and the other lead to a bimetallic thermal strip bent into an inverted "U" shape, one end of which is free with a small contact mounted on it. The small tube contains a gas (helium neon or argon) which will glow at the applied voltage (about 240 volts) which is approximately twice the lamp operating voltage.

To assist the glow there is an emissive coating on the bi-metal strip. With the correct voltage across the switch, the glow is set up which in turn heats the bi-metal strip causing it to bend and finally make contact with the fixed contact. With the contacts of the switch closed there is no longer a glow in the switch and so it starts to cool down. As it cools the bi-metal strip works the opposite way and opens the contact with a quick break, thus providing the voltage surge which strikes the discharge in the lamp. When the lamp is alight the voltage across the lamp is insufficient to re-start the glow discharge in the starter switch whose contacts remain open.

A small condenser is shunted across the contacts of the switch to prevent radio interference and to prolong the peak of the high induced voltage.

In some lamp installations a "non blinking" starter switch such as the "Watchdog" (Figure 5) is used to prevent continuous operation of the starter switch when the lamp fails to strike. A small bi-metal type circuit breaker is included in circuit to open the starter switch circuit in the event of a number of starting operations failing to strike the lamp. After several attempts to light the lamp, heat is generated within the starter switch and this causes the circuit breaker

(a) Glow Type Starter Contd.

to open and so prevent recurrence of the starting function until the lamp is replaced and the starter reset. A small push button is provided to reset the bi-metal latch when the faulty lamp has been replaced.

The "Glow" type starter switch is efficient in most fluorescent installations. However, it should never be used where varying voltages or low ambient temperatures are likely to be experienced - such conditions require a "Thermal" type starter.

(b) Thermal Type Starter.

The "Thermal" type starter switch is heated by a small filament instead of a glow discharge. This type is illustrated in Figure 6.

The switch contacts are normally closed but when the lamp is switched on the lamp filaments commence to heat and so also does the heater filament in the starter switch. The heat from the filament causes the contacts of the starter switch to open thus providing the voltage impulse to start the discharge in the fluorescent lamp. During lamp operation the switch contacts are kept open by the heat from the filament which continues to pass current.

These switches may be enclosed in a glass tube or may be open type, operating in air.

The basic difference between the operation of "glow" and "Thermal" starters is that in the "Thermal" type the initial circuit required through the starter to provide pre-heating of lamp electrodes is opened and kept open by heat in the starter, whereas in the "glow" type the circuit is closed by heat and opened by cooling.

Disadvantages of Starter Switches.

Under ideal conditions the "glow" or "thermal" starter strikes the lamp in a satisfactory manner, but there are many things that can go wrong with it. If the starter switch acts too slowly the time delay is increased. If too quickly, the high voltage pulse will be applied to the cathodes before they have been properly heated. This has a detrimental effect which ultimately reduces lamp life. If the lamp has reached the end of its useful life and does not strike easily, the starter, (unless of the non-blinking type) will attempt to start it again and again producing a most irritating blinking, and as the switch contacts neither make nor break very quickly there is an inherent liability to arcing which injures the starter and may even cause the contacts to weld up. If the contacts weld, the ballast is put on continuous short circuit, with consequent likelihood of overheating. This is shown by the lamp being alight at the ends only.

Fig. 5

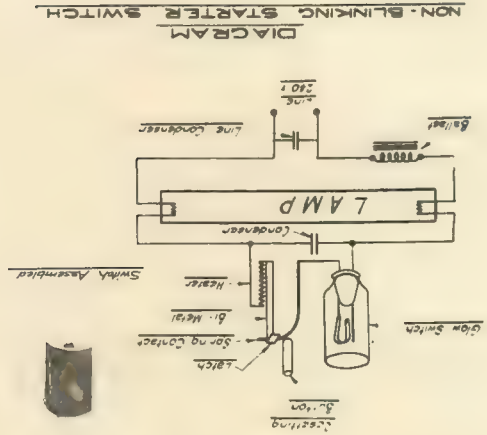


Fig. 3

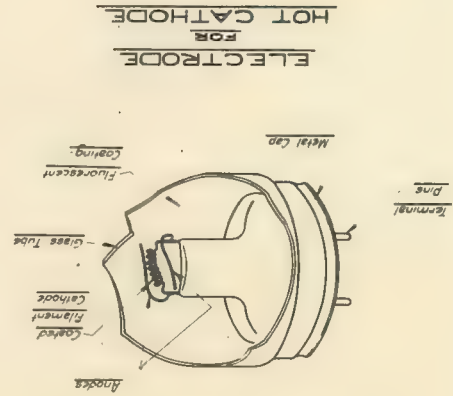


Fig. 1

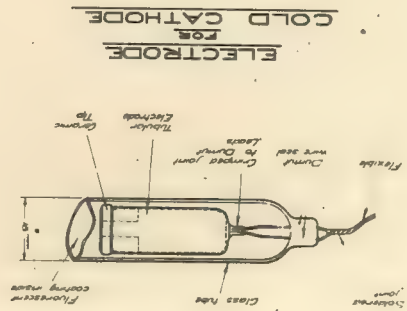


Fig. 6

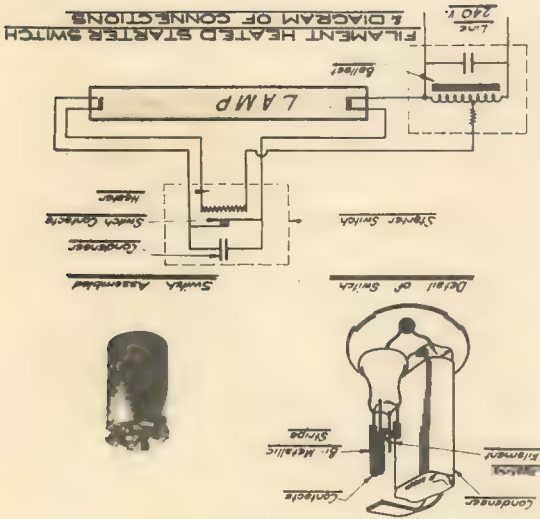


Fig. 4

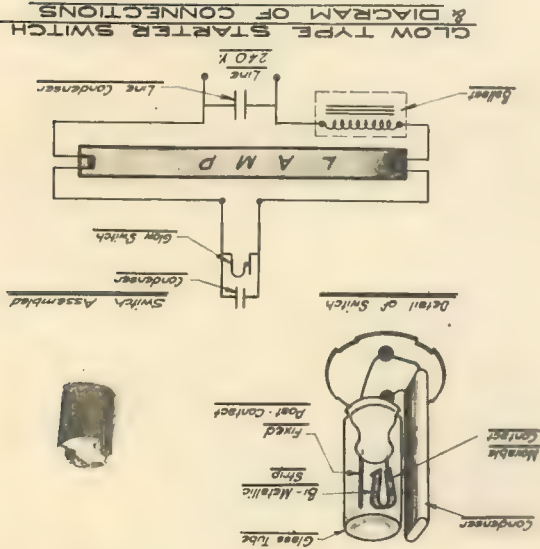
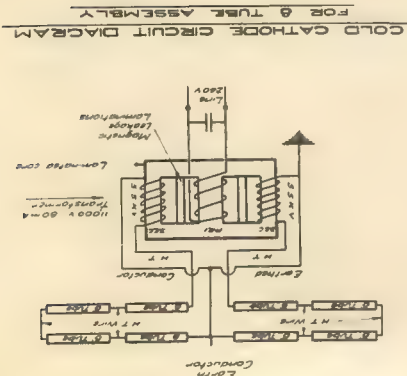


Fig. 2



Item No. 35 - Fluorescent Lighting.

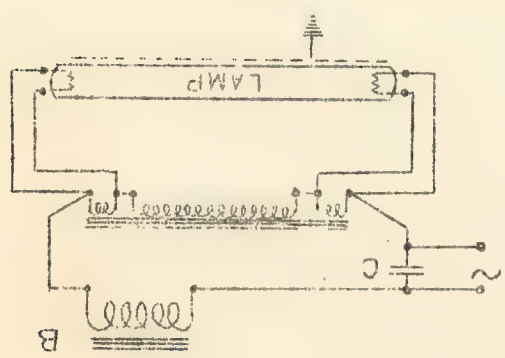


FIG 7

ELECTRODE PREHEATING TRANSFORMERS

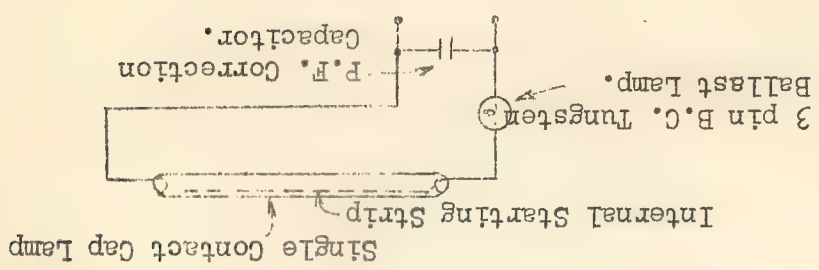


FIG 8

QUICKSTART WITH SINGLE CONTACT CAP LAMP
AND TUNGSTEN BALLAST.

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Disadvantages of Starter Switches, Contd.

Another vulnerable point is the small radio interference suppressing condenser connected across the lamp. The inductive kick which is helpful in striking the arc puts an additional strain on this component, and if it breaks down the ballast is again permanently short circuited.

Warning:

Where starters are metal clad care should be taken as the case of the starter may be "alive" and the metal of the fitting earthed.

6. INSTANT START CIRCUIT FOR FLUORESCENT LAMPS.

To overcome the disadvantages mentioned in connection with the glow type starter switch a quick start circuit has been developed.

The quick start is obtained by using (a) a special electrode preheating transformer with a modified standard type lamp, or (b) a special lamp with heavy electrodes and an internal starting strip connected to one electrode. No starter switch is required in either case.

(a) Electrode Preheating Transformer.

The basic quick start circuit is shown in Figure 7. The ballast has the same function as one used with a starter switch, (see Figure 4) and may be a choke or tungsten lamp but the starter switch circuit is replaced by a small auto transformer (consuming about 2 watts) with windings which supply a low voltage to each of the cathodes. When the power is switched on these low voltage windings heat up the cathodes and as the mains voltage is already applied to the lamp it strikes instantly. During running the windings still circulate current through the cathodes, but as the voltage across the auto transformer now equals the lamp voltage (approximately half the mains volts), the current is greatly reduced and the cathodes do not overheat.

(b) Special Instant Start Fluorescent Lamps.

The special lamp, with single contact caps, heavy electrodes and internal starting strip, does not require a preheating transformer. Lamp sockets with a deep set protected contact must be used, the contact being dead until the lamp is inserted and turned 90°. There are no special earthing requirements with this lamp which represents the simplest method of operating a fluorescent lamp.

These lamps use a standard ballast or a special 60 watt, 3-pin B.C. tungsten lamp as a series ballast to give incandescent light usually directly diffused.

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(b) Special Instant Start Fluorescent Lamps, Contd.

The ignition of the self starting fluorescent lamp is achieved by means of an auxiliary electrode, which serves to reduce the ionization distance between the two main electrodes, so that the gas is ionized as soon as the voltage is applied to the terminals. In other words, a "trigger" discharge takes place which starts off the ionization of the lamp. No pre-heating is required as in the case of standard lamps and the lamp may, on this account, be termed "cold Start". The cathodes are of a heavy construction to withstand the abrupt start.

The auxiliary electrode consists of a semi-conducting strip applied to the inside of the lamp over its entire length. The strip is in contact with one of the electrodes at one end, and close enough to the second electrode at the other end for ionization to take place at normal mains voltage. The lamp, therefore, ignites almost immediately after this auxiliary discharge begins, so that it can practically be termed "instant starting".

The comparatively high resistance of this inside strip prevents higher currents being taken from the mains during the ignition period than during the working of the lamp, as is the case with the standard lamp circuits.

Consequently the ballast is never in any danger of overload.

Advantages of Quick Start Circuits.

The quick start circuit is free from the disadvantages mentioned in connection with the starter switch circuits. There is no high voltage pulse, and therefore, no possibility of the lamp attempting to strike before the cathodes are properly heated.

Moreover, the extra strain on the radio interference suppressor is eliminated. The risk of overheating the choke by an accidental short circuit is, therefore, greatly reduced, and the more even heating of the cathodes by the circulating current helps to maintain lamp life. First attempts to use this type of circuit gave erratic results. It is now known that under certain conditions of atmospheric humidity a semi-conducting layer of moisture which inhibits the striking of the arc, forms on the outer wall of the tube. The inductive kick of the starter switch circuit is sufficient to overcome this "humidity effect" as it is called, but the gentler quick start circuit cannot do so. Two ways have been found to circumvent this humidity effect. One of these is to treat the outside of the tube with a silicone material which prevents moisture wetting the tube; instead of forming a semi-conducting layer, the moisture collects into separate droplets insulated from one another

Advantages of Quick Starting Circuits Contd.

The alternative method is to place an earthed conductor (shown as a dotted line in Figure 7) in close contact with the lamp. This "starter bridge" as it is called may be a thin wire or thin line of conducting paint along the surface of the lamp itself. Alternatively, a suitable metal strip may be built into the lighting fitting (see Figure 8). In this case a specially treated lamp is not required.

Practical tests in which the same 40 watt fluorescent lamp and ballast were operated in turn by quick start and glow switchgear have shown that, for the same light output, the power consumption of the former arrangement is only $3\frac{1}{2}$ to 4 per cent greater than the latter.

The quick start system is more costly as regards initial installation than is the starter switch system.

7. COMPARISONS OF FLUORESCENT LAMPS WITH INCANDESCENT LAMPS.

Maintenance:	More complicated, but life is twice that of filament lamps.
Auxiliary Equipment:	Chokes (i.e. Ballasts), starter switches should be accessible for maintenance.
Switchings:	Life of lamp shortened by frequent switching.
Operating Costs:	Half to one-third that of filament lamps for same light output.
Lighting:	Better quality than filament lamps.
Applications:	Special built in features, such as indirect coves, curtain pelmets, kitchen bench lighting.

The following table gives the equivalent sizes of incandescent filament and hot cathode fluorescent lamps. (over-page).

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7. COMPARISONS OF FLUORESCENT LAMPS WITH INCANDESCENT LAMPS, CONTD.

Hot Cathode Fluorescent Lamp					Wattage required to provide equivalent light output from incandescent filament lamps.
Lamp Watts	Total Watts inc. Losses	Lamp Dimensions Diam. Length		Light Out-put in Lumens	
20W	28	1½ in.	2 ft.	860	75
40	56	1½ in.	4 ft.	2,100	150
2 X 40	95	1½ in.	4 ft.	4,200	300
100	135	2-1/8 in.	5 ft.	4,200	300

8. SERVICE DEFECTS.

Some of the most common faults in fluorescent tubes are listed for the guidance of officers.

- (1) Gradual disintegration of electrode coating causes slight blackening at the ends of the tube extending for a distance of 2" to 3". Blackening is progressive and is a rough guide of the length of service of the lamp. Premature blackening indicates abnormal operating condition. Cold cathode tubes have a normal average life of 10,000 hours. Hot cathode tubes have a normal average life of about 7,000 hours.
- (2) A lamp blinking on and off is a reliable indication that the lamp requires replacing because the electrode coating is exhausted and the mains voltage is insufficient to maintain the discharge. In these circumstances the starting switch is attempting to start the tube discharge. It is important to switch off the tube quickly as damage to auxiliary gear may result.
- (3) Occasionally dark streaks or patches appear along the tube during its life. This is due to condensation of the mercury vapour on the lower (cooler) side of the tube. Rotation of the tube through 180° will give a more favourable position for evaporation.
- (4) Low atmospheric temperatures or cold draughts may make starting difficult resulting in repeated flashing before remaining alight.

8. SERVICE DEFECTS, CONTD.

- (5) Low mains voltage may also produce uncertain starting. High main voltage will produce overloading of the tube and its auxiliary equipment.
- (6) When a lamp makes no effort to start the fault may be:
 - (a) If both electrodes are glowing the elements of the starter switch are probably stuck together. A flick with the finger may enable them to open, if not removal of the starter will start the tube, but a new starter should be recommended.
 - (b) If only one electrode glows there is most likely an earth in the wiring of the starter.
 - (c) If neither electrode glows an open circuit would be suspected. The cause may also be found in defective starter switch.

WARNING:

When examining cold cathode lamp installations officers must be careful of the operating voltages at the supply transformer and the tubes where the voltage is in the range 5,000 to 15,000.

9. CHARACTERISTICS OF HOT AND COLD CATHODE LAMPS.

The purpose of this section is to summarise the main differences between hot and cold cathode fluorescent lamps. The essential difference between the two types is that, whereas the hot cathode lamps operate at normal supply voltages of 230-240 volts, the cold cathode lamp operates at several thousands of volts provided by a transformer.

The different methods of starting are for lamps of totally different forms and characteristics and the table at right summarises these main differences.

(over-page)

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9. CHARACTERISTICS OF HOT AND COLD CATHODE LAMPS, CONTD.

CHARACTERISTIC	HOT CATHODE	COLD CATHODE
Luminous Output		
Lumens per watt (approx.)	42	30
Approx. Lumens per foot of Lamp (4ft. 40W lamp).	520	250
Usual standard lengths of lamps.	(2 ft. (20 watt) (4ft. (40 watt) (5ft. (80 or 100 watt)	Any length up to 7ft. 9ins.
Lamp Diameter	1½ in. (20 and 40 watt)	18mm. (approx. 11/16 in. and 25mm. (approx. lin.)
Nominal wattage of lamp	(20 (40 (80 (100	7 to 8 watts per foot.
Wattage absorbed by Auxiliaries (approximate).	18 (20 watt lamp) 16 (40 watt lamp)	
Average lamp life under good operating conditions.	An excess of 7,000 hours	10,000 hours (usually guaranteed life).
Effect of frequent switching on and off.	Tends to shorten life	No effect.
Lamp behaviour at end of useful life.	Lamp fails to light or lights erratically.	Luminous output falls below standard.
Response to Switching On.	Does not light immediately, flickers once a few times. (This applies to starter switch circuits - quick start circuits do not have this effect.)	Lights immediately.
Stroboscopic effect (Flicker)	Some with single lamps minimised by use of twin lamps. In some cases a "leading" ballast tube in the	

9. CHARACTERISTICS OF HOT AND COLD CATHODE LAMPS (CONTD).

CHARACTERISTIC	HOT CATHODE	COLD CATHODE
Stroboscopic effect (Flicker).(contd.)	fitting on different fittings on different phases, minimises this effect. This is done in machine shops or other places with moving parts or machines.	
Auxiliary equipment required.	Ballast, starter switch power factor correction condensor, for single lamp -- (quick start circuits utilise an auto-transformer in place of a starter switch).	Transformer and power factor correction condensor.
Lamp replacements.	Standard lamps which can be replaced by customers.	Lamp can be replaced only by original supplier. Cannot be readily replaced by customer.

ITEM NO. 36. INTERFERENCE WITH RADIO AND TELEVISION RECEPTION AT CUSTOMERS' PREMISES.1. Information required.

Complaints of interference with customers' radio reception must be treated with extreme caution. Great care must be taken to obtain as much information as possible from customers concerning:-

- (a) The appliances being used or the switching operations being made at the time the radio or television interference was most noticeable.
- (b) the nature of the interference experienced
- (c) whether interference is intermittent or constant
- (d) whether any neighbours are also affected.

Customers'
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ITEM NO. 36. INTERFERENCE WITH RADIO AND TELEVISION RECEPTION (CONT).

2. Some Possible Causes of Interference on a Particular Installation.

Sometimes, by questioning the customer, information can be obtained that will indicate that the cause of the interference is an intermittent insulation fault to earth which may cause high voltage leading to failure of lamps and valves.

Another cause of interference is a loose contact at the service fuses, the meter terminals, or point of attachment. This usually manifests itself at the time when the load on the particular installation is high.

3. Numerous Complaints from a Particular Area or District.

Officers must always be alert to notice numerous complaints of radio or television interference being received from any one area or district at about the same time. Such reports, and other reports indicating that a fault may exist in S.C.C. mains or apparatus must be referred immediately to the System Operator.

It may follow that attention will be directed to some defect in apparatus the property of the Sydney County Council, in an incipient state of breakdown.

Timely discovery will enable the System Operator to arrange for the adjustment or disconnection of the defective apparatus before ultimate failure and so avoid inconvenience being caused to a great number of customers.

Instances have been noted where a number of complaints of radio interference caused an inspection of a local substation to be made with the result that an excessive single phase loading on a particular low voltage feeder was detected. Ultimately, the cause was traced to the failure of a customer's wiring at the point of attachment. The fault was of an intermittent nature and did not, as would be usual, burn itself clear.

Note: Customers making complaints of interference which appear to be caused by Zellweger relay operation will be advised that their complaint will be reported for attention.

Code: 6-N

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ITEM NO. 36. INTERFERENCE WITH RADIO AND TELEVISION RECEPTION (CONT).

2. Some Possible Causes of Interference on a Particular Installation.

Sometimes, by questioning the customer, information can be obtained that will indicate that the cause of the interference is an intermittent insulation fault to earth which may cause high voltage leading to failure of lamps and valves.

Another cause of interference is a loose contact at the service fuses, the meter terminals, or point of attachment. This usually manifests itself at the time when the load on the particular installation is high.

3. Numerous Complaints from a Particular Area or District.

Officers must always be alert to notice numerous complaints of radio or television interference being received from any one area or district at about the same time. Such reports, and other reports indicating that a fault may exist in S.C.C. mains or apparatus must be referred immediately to the System Operator.

It may follow that attention will be directed to some defect in apparatus the property of the Sydney County Council, in an incipient state of breakdown.

Timely discovery will enable the System Operator to arrange for the adjustment or disconnection of the defective apparatus before ultimate failure and so avoid inconvenience being caused to a great number of customers.

Instances have been noted where a number of complaints of radio interference caused an inspection of a local substation to be made with the result that an excessive single phase loading on a particular low voltage feeder was detected. Ultimately, the cause was traced to the failure of a customer's wiring at the point of attachment. The fault was of an intermittent nature and did not, as would be usual, burn itself clear.

Note: Customers making complaints of interference which appear to be caused by Zellweger relay operation will be advised that their complaint will be reported for attention.

Code: 6-N

4. STANDARD SUPPLY VOLTAGE

In providing a low voltage supply to customers the Council aims to maintain voltage within the limits 230-254 to neutral at the customers service even though no statutory limits are specified.

Officers sent for this purpose may be guided by the following information.

5. VOLTAGE AT POWER OUTLET.

Most reputable makes of television receivers are despatched from the manufacturer's works with the power leads connected to the 240 volt tap on the transformer primary winding (most sets have power transformers). The majority of sets are designed and adjusted to operate satisfactorily if the voltage level departs from normal 240 by $\pm 10\%$.

When the supply voltage to a television receiver in proper working condition drops below the level to which it has been adjusted to give a full picture, black borders at the top and bottom of the picture appear, followed as the voltage drops by black borders on the sides of the picture. As the voltage is reduced the picture brilliance drops and at a certain voltage the picture may lose synchronism and "break up". When any of these conditions become apparent or service technicians report low voltage below 230 volts at the power outlet supplying the set, Emergency Service Offices shall return this information over radio for attention by the System Operator.

6. DEFECTS IN TELEVISION RECEIVERS

There are defects in components wiring etc. of television receivers which can give rise to complaints against supply voltage or for which electricity supply may be blamed. Rectifiers, in particular, which have just about reached the end of their useful life make a television receiver very critical to voltage level and can result in unsatisfactory operation or even no picture at all at a voltage level where otherwise quite satisfactory results would be achieved.

Picture width and height can also be affected by partly worn out valves while poor picture brilliance and contrast may result from a picture tube in need of replacement. These symptoms lead customers to blame the power supply and they are supported in some instances by television maintenance personnel who are unable to identify a fault or who are anxious to shift the blame for unsatisfactory operation.

When a low voltage level appears to be the cause of unsatisfactory television receiver operation, report the apparent low voltage for the subsequent attention of the Mains Branch staff but do not advise the customer that the unsatisfactory operation is due to the supply voltage.

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7. SWITCHING OF TELEVISION RECEIVERS

Television receivers deteriorate more rapidly with frequent switching "on". While the usage of sets determines the number of switchings, manufacturers advise that there is a greater risk of break-down of certain parts if a switching "on" follows closely (within say 1 minute) a switch "off".

Some sets are designed to be switched "off" at the switch provided on the set to avoid burning a spot on the screen of the picture tube where the electron beam comes to rest.

Officers finding it necessary to interrupt supply or to work on a circuit which supplies a television receiver should first ask the customer to switch "off" the set.

8. INTERMITTENT SUPPLY

A poor connection causing supply to a television receiver to be intermittent can show on the screen as a contraction and expansion or "break up" of the picture. However, defects within the set can also cause the same symptoms.

Faced with this situation an officer should make the usual examination to locate any faults on the installation or service. If no defect can be located the customer should be so advised so that he may make whatever arrangements he wishes to have the set serviced.

9. FLUCTUATING SUPPLY

Customers may experience unsatisfactory operation of their television receivers by reason of voltage fluctuation caused by the operation of equipment connected usually to the same low voltage distributor.

The symptoms, usually alteration in height and brilliance of the picture as the voltage level alters, can also be caused by defects within the set.

In these circumstances the officer attending shall obtain full particulars of the times during which the unsatisfactory operation is noticed, the apparent frequency of supply variations, the voltage level and any other facts for the subsequent attention of the Mains Branch.

10. ACTION TO BE TAKEN

If, after investigation, no apparent reason for the interference can be deduced, the customer shall be advised to apply at the nearest Post Office for a form known as "Radio Reception Questionnaire" or "Television Reception, Report of Interference" as the case may be. The form when completed should be forwarded by the customer to the Superintendent, Radio Branch, G.P.O., Sydney, who will make an investigation.

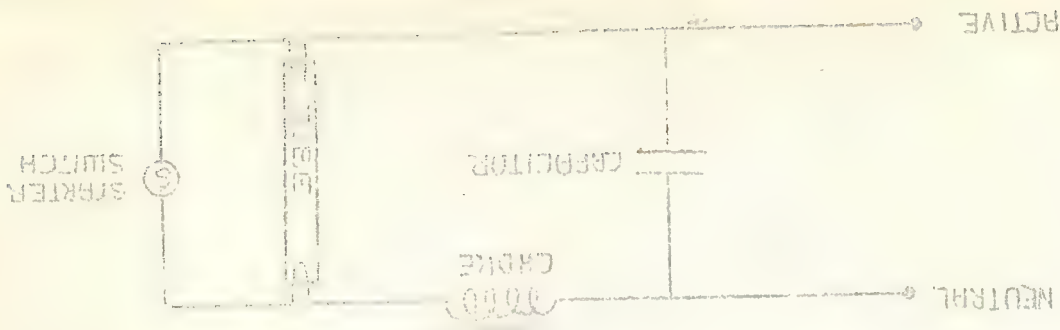
One most undesirable effect of the third harmonic generated in fluorescent lamps is the very considerable variation which has to be allowed in the value of the phase current which may be of the order of 3/5 of the value of the phase current as given in the following description.

The causes of these currents which may be of the order of 3/5 of the value of the phase current are given in the following description.

Any gas ions are discharged in the cathode, and in a fluorescent lamp operating on a 50 cycle per second supply, the effective resistance of the discharge varies continuously throughout each cycle. It is found that as current in the discharge increases, the effective resistance decreases.

The property of decreasing resistance with increasing current brings the fluorescent lamp into the scope of devices having negative resistance characteristics; therefore, some type of control gear is necessary to operate it. A tube directly connected to the mains would "run-away" drawing ever increasing current until finally the fuses, or the lamp blows. This condition is corrected by including a suitable inductance (a ballast) in the circuit, which makes the lamp run steadily at its designed current and voltage.

Over the past few years many different types of ballasts and various circuits have been introduced in installations of low voltage gas cathode fluorescent tube lamps, for the good purpose of starting the lamp as smoothly as possible and running the lamp stably. A number of types of special instant-start fluorescent lamps have also been introduced. However, the simple switch-start circuit (which includes a high resistance choke coil) which was one of the earliest circuits for the hot cathode fluorescent lamp is still the most commonly used, either with or without the inclusion of a capacitor for power factor correction. (See sketch below.)



ITEM NO. 37 - AID TO CUSTOMERS WHOSE INSTALLATIONS HAVE BEEN WHOLLY OR PARTLY DESTROYED1. Circumstances Under Which Assistance Will Be Given

When officers of the System Operation Branch discover that a customer is seriously inconvenienced because the electrical installation has been wholly or partly destroyed by fire or other circumstances, they will offer to render such aid to the customer as is necessary so that supply may be restored temporarily until the customer can arrange for permanent repairs to be effected.

The necessity for assistance should arise only when the services of an electrical contractor are not available to the customer or when the contractor himself is in difficulties.

2. Use of Material the Property of The Sydney County Council

When it is necessary in these circumstances to use any material the property of The Sydney County Council a signed undertaking to pay the cost of the labour and material used must be obtained from the customer.

Officers must state in the Service Report the exact quantities of the materials used.

ITEM NO. 38 - DAMAGE CAUSED BY ABNORMAL ELECTRIC SUPPLY1. High Voltage, Low Voltage Storms etc.

It is usual when high voltage feeders fall down across low voltage distributors, or when, during storms, lightning strikes high and low voltage conductors and a number of customers are affected, for a Supervisor to attend the location and after assessing the damage, to call for the necessary field staff to restore supply.

However, it is not uncommon for an Emergency Service Officer to be first to visit such reported trouble. He shall make a survey and report to the Despatch Co-ordinator who will notify the Supervisor Em.S.Os.

Note: A survey will consist of noting any visible damage to the installation at the address first visited. If this inspection shows signs of damage to service wiring, meter board, meter, etc., customer's switch boards, earthing conductor at water pipe or soldered joints on water pipes melted causing water leaks; the attending Em.S.O. must then check at adjoining premises for similar damage and report his findings to the Despatch Co-ordinator.

He must not under any circumstances admit liability. If asked by customer he should advise to have damaged equipment repaired, and if they feel they have a claim on the Council to make such claim in writing to the General Manager who will consider and make the decision regarding any such claims.

2. Restoration of Supply After Mains Re-Energised

Emergency Service Officers shall restore supply to individual customers by:-

- (1) Isolating faulty wiring and equipment.
- (2) Installing temporary services (without cost to customer).
- (3) Installing Council loan switch fuse to control customer's circuits where necessary.
- (4) Bridging damaged meters to give supply.
- (5) Replacing Council's and customer's blown fuses.

3. Damage to Customer's Installation

Where installations and equipment have been damaged, the following information should be obtained where practicable:-

- (a) Extent of damage.
- (b) Make and type of equipment.
- (c) Whether equipment was left operating safely.
- (d) Any information which will assist in determining whether or not the Council should effect repairs to the equipment.

Note: When obtaining the required information, an external visual examination only shall be made and equipment shall not be dismantled.

4. Emergency Service Reports

Each Emergency Service Officer shall report on his daily run sheet, or on an attachment thereto, showing for each premises visited:-

- (1) If access was gained to the premises.
- (2) If damage was sustained at premises.
- (3) Full details of all damaged equipment.
- (4) The action taken to restore supply.
- (5) Any information or advice given to customer.

FORM 26A (CONT'D)

All discharge lamps when burning in a normal manner on alternating current have a non-uniform light output as the light drops almost to zero with each half-cycle thus causing a period flicker. The persistence of the glow in the fluorescent power on fluorescent tubes helps to reduce this effect, which, in most installations is hardly noticeable.

The lamp characteristics of fluorescent tubes being what they are, the wave form of the current through the circuit also becomes distorted. In order to obtain suitable lamp starting conditions, the practical circuit requires the use of a choke with saturated characteristics and this causes further distortion of the wave forms.

Any repetitive wave form may be considered as the summation of a number of sinusoidal wave forms (harmonics) so that the lamp current wave form can be considered as the addition of a series of sine waves having different amplitudes and phases to that of the original wave form.

It has been established that in a well-designed and power-factor corrected installation the current in the line contains 15-20 per cent harmonics.

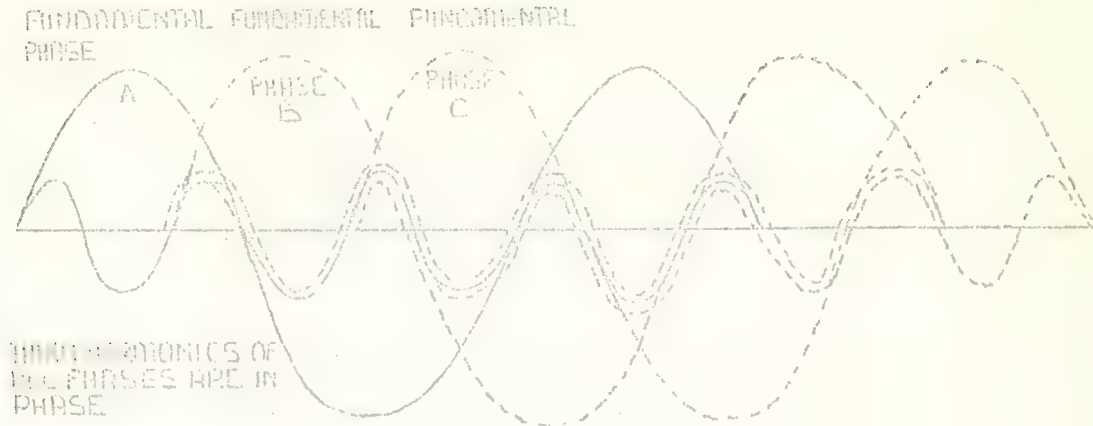
In single phase installations of a small number of fluorescent tubes, these harmonics cause no difficulties, but in large three phase installations a problem is created.

Except in special cases, large lighting installations are operated from a three-phase four-wire supply system and equal numbers of lighting fittings are connected between each of the three-phase conductors and the neutral of the supply.

With equal loads passing undistorted currents, for example, tungsten filament lamps, the current in the neutral conductor is zero. However, in the case of loads taking distorted currents, as with fluorescent lamps, then even when the loading of the three phases are equal, a current which could be 45-60% of the phase currents will flow in the neutral for the following reasons:-

Suppose each current wave consists of two components, the fundamental and the third harmonic. Then since the three loads are equal in all respects, the magnitudes of the two components and their phase relationship will be the same in each phase. The diagram below, which represents three equal loads connected to the three phases, shows that all the third harmonics are always in phase, further it is seen that while the sum of the fundamental components is zero at all times, the sum of the third harmonics at any time is equal to three times the instantaneous value of the third harmonic current in any one of the phases. Thus, the resultant fundamental current in the neutral is always zero but the third harmonic currents in the three phases add up and flow in the neutral.

ITEM 366 (CONT'D)



Similarly all the odd harmonics which are multiples of 3 times the fundamental frequency i.e. 3rd, 9th, 15th etc. are always in phase in a balanced 3 phase, 4 wire system and thus cause a neutral current to flow.

As 15-20 per cent harmonics are contained in the mains current of switch-start fluorescent lamp circuits, the neutral current in a balanced 3 phase, 4 wire system is about 30-40 per cent of the phase current. If the neutral conductor is only half the cross section of the phase conductors as it sometimes is, it could be overloaded with this type of installation, due entirely to the third harmonic currents.

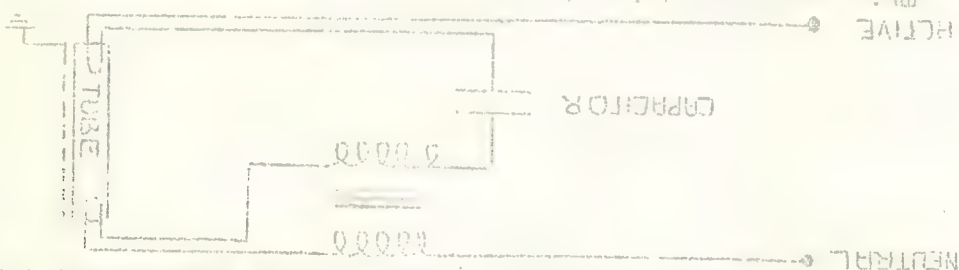
It is common practice today for supply authorities to permit the installation of fluorescent fittings without insisting on the inclusion of a capacitor for power factor correction. The third harmonic distortion of the wave form and the current produced in the neutral from this source in a balanced 3 phase, 4 wire installation are not affected by either fitting, or not fitting, such a capacitor but remains unchanged. The only difference is that the phase current when using fittings without capacitors is considerably greater than when using fittings with capacitors, so that the neutral current appears to be a smaller percentage of the phase current. This is shown by the following test results for a normal switch-start circuit with one of three similar 40 watt fluorescent lamp units connected in each phase of a 3 phase, 4 wire supply:-

CONDITION	AVE. PHASE CURRENT	NEUTRAL CURRENT	PERCENTAGE OR NEUTRAL TO PHASE CURRENT
Circuit without capacitor	0.40	0.096	24%
Circuit with capacitor	0.25	0.025	10%

It will be seen that in each case the neutral current is about .1 of an ampere, but in the second example this appears to be a greater percentage of the phase current because this current is considerably reduced by the installation of capacitors.

New Type Circuits

A number of circuits have been developed to correct this disadvantage of producing third harmonic in the neutral, one not being the circuit given below using a semi-resonant starless ballast.



This arrangement has the property of keeping the neutral current in a balanced three-phase, four-wire system below the 50 per cent level. In addition it has other advantages, in particular its series preheating arrangement which ensures equal treatment of lamp electrodes and a smooth and flickerless start.

Neutral Current

A phenomenon which is sometimes noticed with individual fittings is that the tube current is low, usually the only and neutral current with for a ballast. The ballast is a controlling factor and has been placed in the "off" position. This current can be traced to the neutral being incorrectly joined in the "on" position. Instead of the current being shared by the two tubes, it is all taken by the neutral and the glow is confined to the tube. The tube is then connected to the neutral and the potential across the tube.

TYPE 361 (CONF'D)

discharge lamp when turn on. Alternating current have a non-uniform light output as the light drops almost to zero with each half-cycle thus causing a period flicker. The flicker of the light in the fluorescent lamp on fluorescent tubes is hardly noticeable.

The lamp characteristics of fluorescent tubes being what they are, result in the development of a distorted wave form so that the wave form of the current through the lamp is distorted. In order to obtain suitable lamp operation, a practical circuit requires the use of a choke with inductive reactance and this causes further distortion of the wave forms.

Any repetitive wave form may be considered as the summation of a number of sinusoidal wave forms (harmonics) so that the lamp current wave form can be considered as the addition of a series of sine waves having frequencies of one, three, five etc. times that of the original wave form.

It has been established that in a well-designed and power-factor corrected switch-start fluorescent lamp circuit, the mains current contains 15-20 per cent harmonics.

In single phase installations with a small number of fluorescent tubes, these harmonics cause no difficulties, but in large three phase installations a problem is created.

Except in special cases, large lighting installations are connected from a three-phase four-wire system and each neutral of lighting fittings are connected between one of the three phase conductors and the neutral of the supply.

When equal loads are connected to each phase, for example, fluorescent lamps, the current in the neutral conductor is zero. However, in the case of fluorescent lighting circuits, as with fluorescent lamps, then even when the loading of the three phases are equal, a current which could be 45-60% of the phase currents will flow in the neutral for the following reasons:-

Suppose each current wave consists of two components, the fundamental and the third harmonic. Then since the three loads are equal in all respects, the magnitude of the two components and their phase relationship will be the same in each phase. The diagram below, which represents these current components in the three phases, shows that all the third harmonics are always in phase, further it is seen that while the sum of the fundamental components is zero at all times, the sum of the third harmonics at any time is equal to three times the instantaneous value of the third harmonic component in any one phase. The resultant fundamental current in the neutral is always zero but the third harmonic currents in the three phases add up and flow in the neutral.

manager who will consider and make the decision regarding any such claims.

2. Restoration of Supply After Mains Re-Energised

Emergency Service Officers shall restore supply to individual customers by:-

- (1) Isolating faulty wiring and equipment.
- (2) Installing temporary services (without cost to customer).
- (3) Installing Council loan switch fuse to control customer's circuits where necessary.
- (4) Bridging damaged meters to give supply.
- (5) Replacing Council's and customer's blown fuses.

3. Damage to Customer's Installation

Where installations and equipment have been damaged, the following information should be obtained where practicable:-

- (a) Extent of damage.
- (b) Make and type of equipment.
- (c) Whether equipment was left operating safely.
- (d) Any information which will assist in determining whether or not the Council should effect repairs to the equipment.

Note: When obtaining the required information, an external visual examination only shall be made and equipment shall not be dismantled.

4. Emergency Service Reports

Each Emergency Service Officer shall report on his daily run sheet, or on an attachment thereto, showing for each premises visited:-

- (1) If access was gained to the premises.
- (2) If damage was sustained at premises.
- (3) Full details of all damaged equipment.
- (4) The action taken to restore supply.
- (5) Any information or advice given to customer.

must be reported immediately.

There must be evidence that the seal is attached to the equipment with the initials and the number of the sealing device. It is to be attached to the equipment in the following manner:

Figure 1 shows an approved method of sealing equipment with the following posts, such as small boxes containing items or documents for C.I. marking.

knot as shown in Figure A1.

Equipment are mounted close together, the sealing wire shall be tied in a knot the seal cannot be fixed close to the sealing holes, as has been shown in Figure A2. Figure C shows a seal attached to a service box. Figure B shows a metal branch seal attached to a metal cover in the approved manner and the sealing holes are sufficiently spaced to be completely effective.

may be fitted without the knot being tied provided the length of wire between the seal and the service boxes, the sealing wire shall pass through all holes and the knot of a hole in a screw or nut and an adjacent hole in a cover, case, part or top. With holes and marking equipment, where the sealing facilities consist of a hole in a screw or nut and an adjacent hole in a cover, case, part or top.

knot and the seal attached as in (a) above.

on the top of the equipment. The sealing wire shall then be tied in a knot passed once through the hole in this study and through the extended sealing tag bent up to cover the head of the screwing screw. The sealing wire shall be In the case of the fixed service boxes, the sealing wire shall be

appearances as near as possible as shown in Figure A3.

(f) The wire with the seal attached shall be doubled back to make the

(e) Any surplus wire projecting from the seal shall be cut off.

pliers used are clearly legible.

(d) The seal shall be stamped tightly with the sealing pliers to ensure that the wire cannot be withdrawn and that the identification markings of the

as short as possible in all cases.

(c) The length of twisted wire between the knot and the seal shall be kept

lead seal, and returned through the other as shown in Figure A2.

(b) The sealing wire shall be twisted together, passed through one hole in the

seal knot as shown in Figure A1.

(a) Where the sealing facilities on equipment consist of holes through covers or covers or covers (e.g. C.I. type this will be the sealing wire shall be passed through all holes once and tied close to the equipment with a

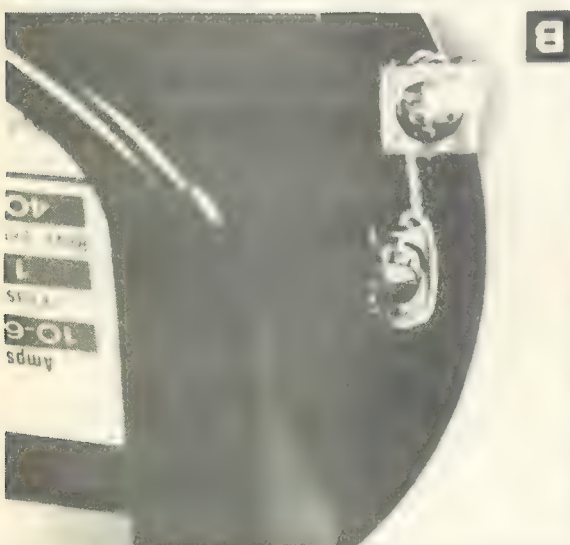
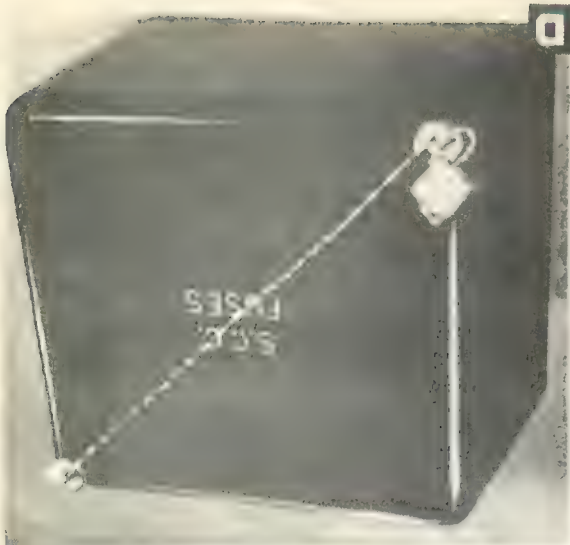
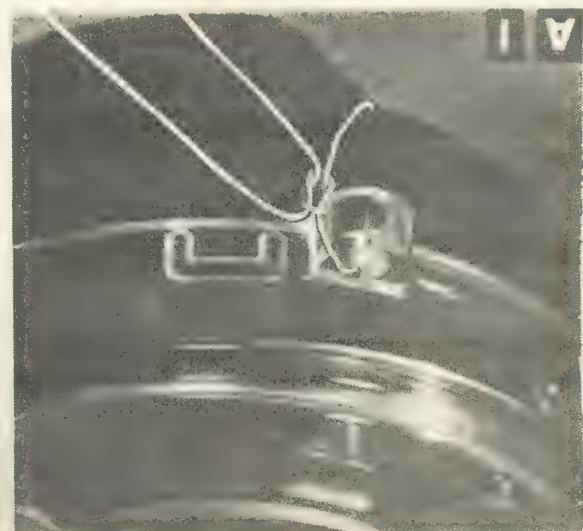
that sealing is effective and shall be adopted by all of those concerned. The method of sealing and cut before a photograph is taken of the photograph is the standard method and it will, in general, ensure

immediately.

It is to be attached to the equipment in the following manner:

Figure 1 shows an approved method of sealing equipment with the following posts, such as small boxes containing items or documents for C.I. marking.

Figure A1 shows a seal attached to a metal cover in the approved manner and the sealing holes are sufficiently spaced to be completely effective.



ITEM NO. 40 CONNECTION OF CABLES TO TERMINALS.

Attention of Emergency Service Officers is drawn to the following requirements when checking or connecting cables to terminals:-

1. When baring cable the covering shall be carefully cut on the taper to avoid notching the cable strands.
2. The bared strands of the cable shall be twisted together tightly with pliers.
3. If the cable is to be bent close to the termination it shall be set before the connection is made.
4. Grub screws etc. securing the termination shall be screwed up firmly.
5. When connecting tails installed by a contractor ensure that the above requirements have been met.

The procedure outlined applies to connections at point of attachment, house service connector boxes, cut-out and link boxes, floor connections to rising mains etc. and also to motors and other apparatus.

The possibility of a defective connection is greatest when wire or cable is subject to some movement.

ITEM NO. 41 PREMISES OR LOCATIONS IN AREAS RETICULATED BY OTHER AUTHORITIES.1. Officers erroneously Directed to Premises or Locations in other Areas.

Sometimes officers are erroneously directed to premises or locations in those parts of other supply areas which are on the fringe of the areas reticulated by the Sydney County Council. In these circumstances officers may render the service usually provided for customers of the Sydney County Council.

2. Assistance to Remove or Deal with Hazards.

The Police, Fire Brigade, some other authority, or a member of the public might call upon an officer of the System Operation Branch, travelling through another area, to render assistance to remove or deal with a hazard.

After emergency service has been rendered, the officer of the System Operation Branch shall, if necessary, remain in the vicinity until the arrival of the appropriate officer and shall supply that officer with all facts relating to the action taken on his behalf.

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3. Ordinary Requests for Service Received Direct by Officers.

No officer shall of his own volition enter any premises connected to mains that are not reticulated by the Sydney County Council.

Particulars of ordinary requests for service received direct by officers shall be conveyed as soon as possible to the Despatch Officer who shall advise the appropriate authority.

4. Responsibility for Action Taken.

Action to assist a customer of another authority will only be taken on the express understanding that though all reasonable assistance will be rendered to the authority concerned, the Sydney County Council will not accept any responsibility for any action taken on behalf of that authority.

5. Further Work.

Officers attending at premises connected to mains reticulated by other authorities shall not leave any cards or give directions concerning further work. Any information relating to further work that may be necessary shall be reported without delay to the Despatch Officer who shall advise the appropriate authority.

6. Advice to Despatch Officer.

Officers who attend at any premises connected to mains not reticulated by the Sydney County Council shall notify the Despatch Officer as soon as possible of such attendance and of any action taken to render service.

ITEM NO. 42 PRIVATE PROPERTY DAMAGED BY OFFICERS OF THE SYSTEM OPERATION BRANCH.

1. ACTION BY OFFICER CAUSING DAMAGE.

Should any officer of the System Operation Branch damage, deface or break private property in any way the owner of the property shall be immediately informed of the occurrence and advised that appropriate attention will be given to the damaged property as soon as possible.

The officer concerned shall immediately report verbally to the officer under whose direction he is working at the time and shall at the first available opportunity forward a written report giving full details of the circumstances.

Emergency Service Officers shall include details in their Service Reports and also forward duplicate Service reports addressed to the Supervisor-Emergency Service Officers.

1. ACTION BY OFFICER CAUSING DAMAGE CONTD.

District Operators shall make their written reports on "District Operators Report Sheets" addressed to the Supervisor - District Operators.

Minor, permanent or temporary repair work shall be carried out immediately by the officer causing the damage.

No officer of the System Operation Branch shall inform any customer or the representative of the customer the extent of the liability acceptable by The Sydney County Council.

2. REPORTS RECEIVED FROM OWNERS OF PRIVATE PROPERTY OF DAMAGE BY COUNCIL EMPLOYEES.

Any officer of the System Operation Branch who receives from the owner of private property a report of damage having been caused to the property by an employee of The Sydney County Council, shall record the full details in writing and forward the report immediately to the Supervisor.

The owner of the property shall be informed that the report will be forwarded for attention by a responsible officer.

ITEM NO. 43. CONCRETE BLOCK ROOM HEATERS.

Concrete Block Room Heaters are manufactured in two sizes with an electrical rating of 1.5kW and 1.1kW respectively.

Provision of rate control equipment is necessary in order that such heaters can be controlled in accordance with the provisions of the restricted hours rate applicable to this type of load.

The heating period is 10.00 p.m. - 7.00 a.m. daily with the exception that the heaters are not energised on Friday or Saturday nights, or on both Friday and Saturday nights, depending on the customers' requirements.

A Sangamo time switch fitted with an omitting device is used primarily for the rate control of such heaters.

The minimum loading of a group of heaters is 5.0kW each. This exceeds the contact rating of the time switch and therefore necessitates the use of an Auxiliary Control Relay, type 3C or 4C.

Details of the operation of the time switch and diagrams of the Auxiliary Control Relays are contained in Section No. 8 of this Handbook.

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ITEM NO. 44 SERVICES UNDER LOCK AND KEY AND IN UNUSUAL SITUATIONS.

1. Master Keys for Locks on Cabinets enclosing Metering and Switchboards on certain Customers' Premises.

Locked cabinets enclosing metering and switchboards on certain premises have been fitted with standard locks known as "MB" and "NMB" locks.

"MB" and "NMB" keys for opening these locks are issued to officers of the System Operation Branch so that access to the meters and switchboards may be obtained when necessary.

Officers having occasion to open any of these cabinets must ensure that the cabinets are locked again before leaving the premises.

ITEM NO. 45 UNSATISFACTORY SUPPLY AT CUSTOMERS' PREMISES.

When irregularity in supply at a customer's premises cannot be rectified by the officer visiting the premises and appears to be caused by a defect in the Sydney County Council's mains and apparatus that requires further investigation, the fullest possible information must be obtained for inclusion in the Service Report for the job.

Information which may be of value includes:-

(a) When the fault occurs, e.g.:-

- (i) Continuously.
- (ii) Particular times of day.
- (iii) During windy weather.

(b) Neighbours have similar trouble.

(c) Previous occurrence, if any.

(d) Trouble since installation of new appliance or since wiring alterations were made.

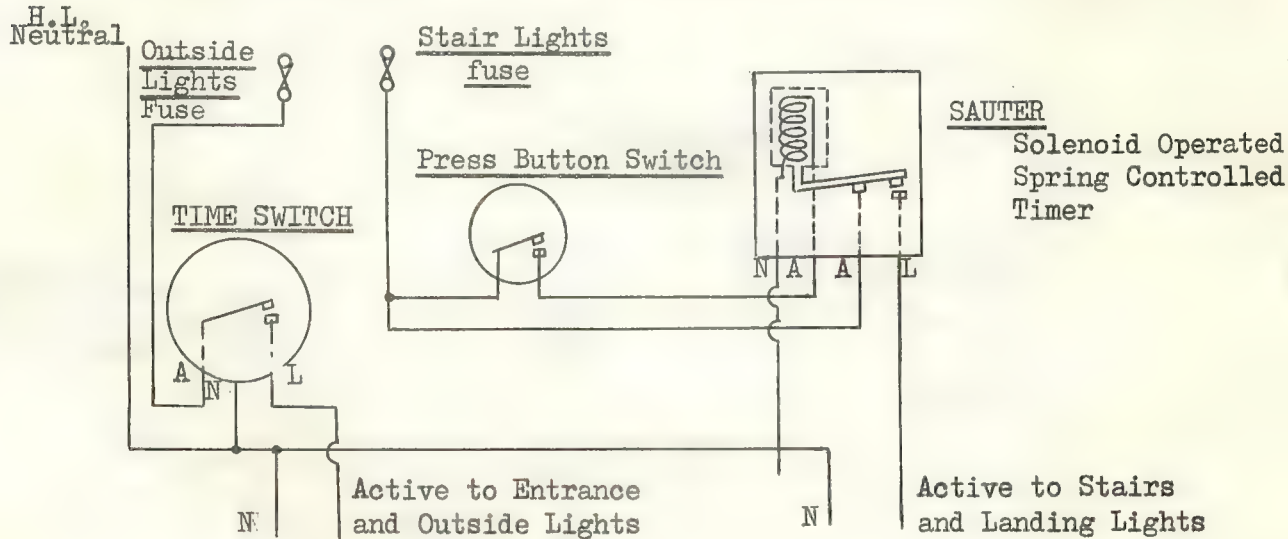
If the customer offers information regarding voltage levels, the customer shall be thanked and the information recorded on the Service Report.

CUSTOMERS' INSTALLATIONS

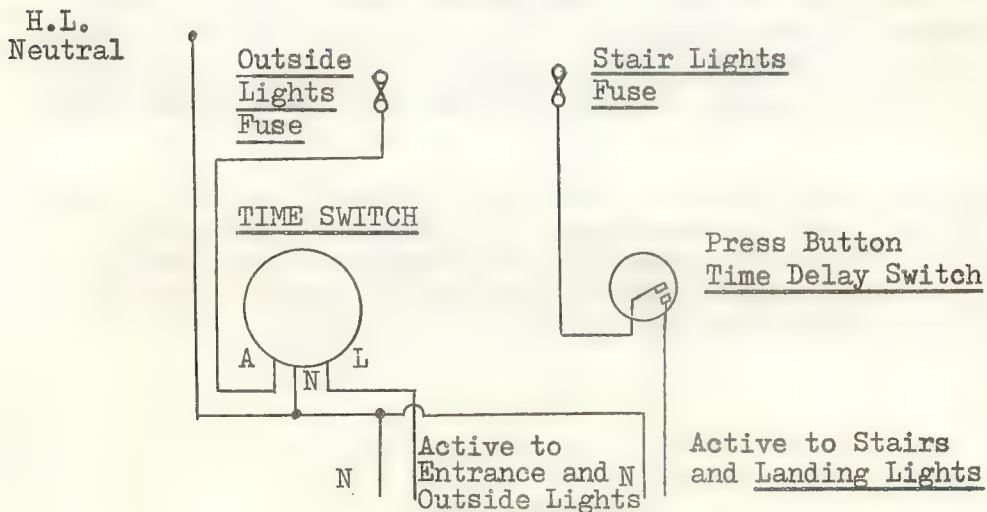
Item No. 46 - House Lighting Control

House lighting in the newer Home Unit and Flat dwellings is now dual controlled: the outside and entrance lights by time clock and the stairs and landing lights by time delay switch or controller.

Below are two methods of house lighting control, the first employing the SAUTER solenoid operated, spring controlled timer, and the second using a CLYPSAL press button time delay switch.



-- DIAGRAM 1 --



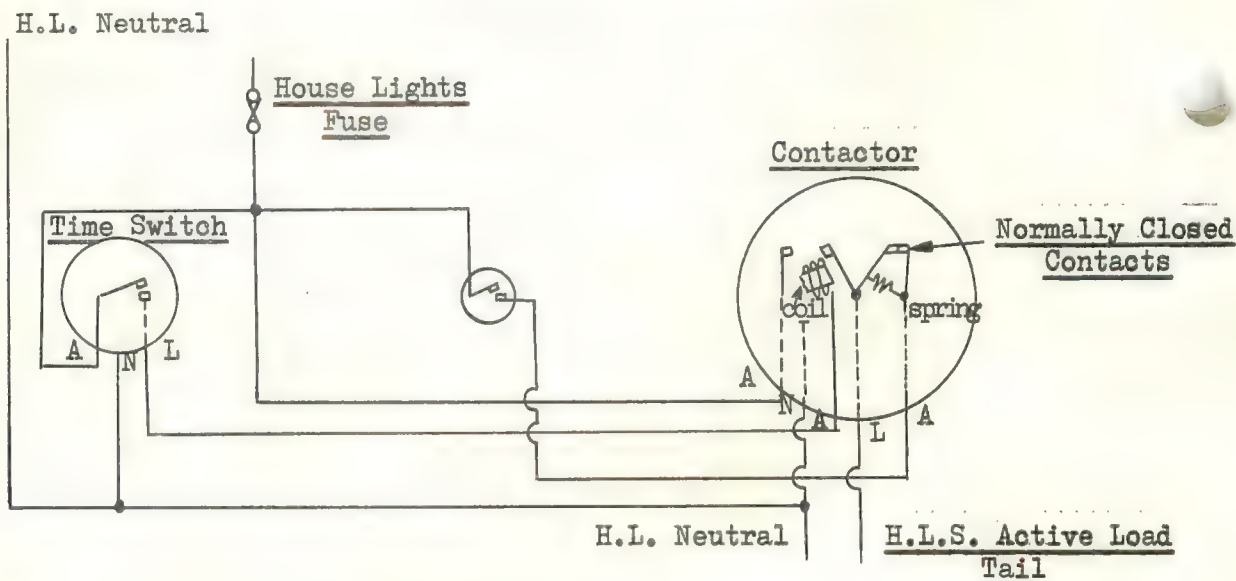
-- DIAGRAM 2 --

CUSTOMERS' INSTALLATIONS

Item No. 46 - House Lighting Control (Cont'd.)

The press button switches in diagram 1 and the press button time delay switches in diagram 2 are generally situated on each floor of the premises and are connected in parallel. The Clypsal time delay switch has adjustable time lag which allows the switch contacts to open in from 1 to 5 minutes after the switch was closed. Em.S.Os are advised not to attempt adjustment to these switches.

In diagram 3 is a method of controlling ALL house lights by time clock and/or press button time delay switch and employing a double throw contactor.



-- DIAGRAM 3 --

With this arrangement, the house lights are under the control of the press button time delay switch for the greater part of the 24 hours of the day as the normally closed contacts of the contactor are held closed by a spring and the house lights will light whenever the switch is pressed, and stays alight for the set period of 1 to 5 minutes until the switch automatically opens.

For a limited number of hours each night (depending on the setting) the time switch will be closed which actuates the solenoid in the double throw contactor, thus opening the "normally closed contacts" and closing the circuit through the other set of contacts so that all house lights are on continuously for the period that the time switch is out in.

ITEM NO. 47 LIGHTING DIMMING UNITS.

Light dimming units are now being installed in private homes, flats and commercial premises in increasing numbers. They range in size from 300 V.A. to 1200 V.A. for domestic and up to 16.8 KVA for commercial premises. These units are used to control incandescent lighting, fluorescent lighting, or a combination of both.

The domestic type dimmer unit is designed with a H.P.M. "All-way" Key and is fitted in a 2 gang architrave switch plate in conjunction with a H.P.M. 10 Amp. "All-way" switch.

Below are the circuits for the domestic type dimmer units.

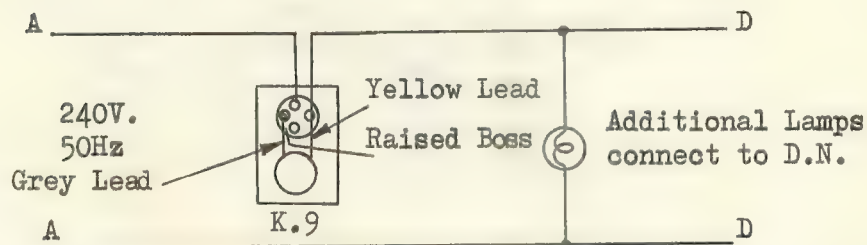


FIG.1: INCANDESCENT LAMPS

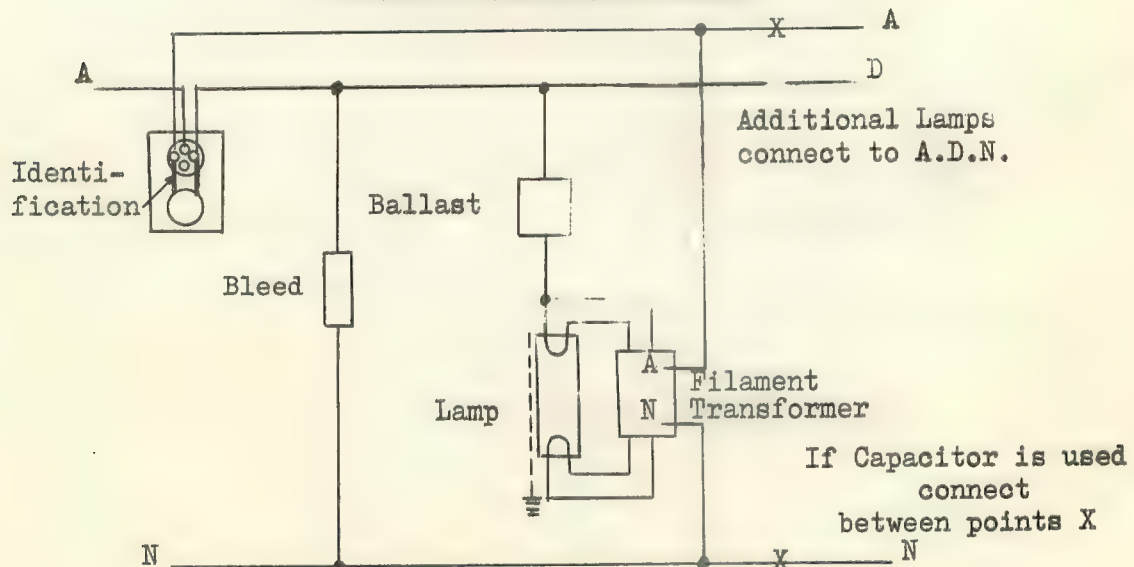
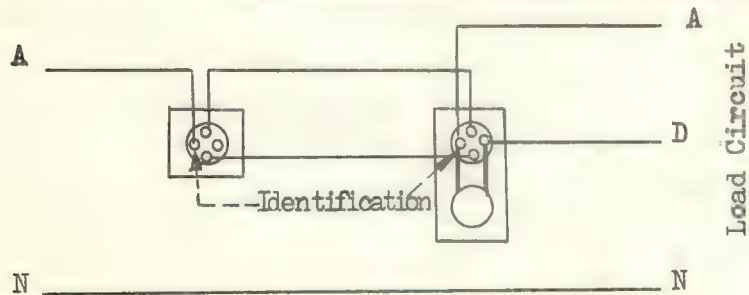
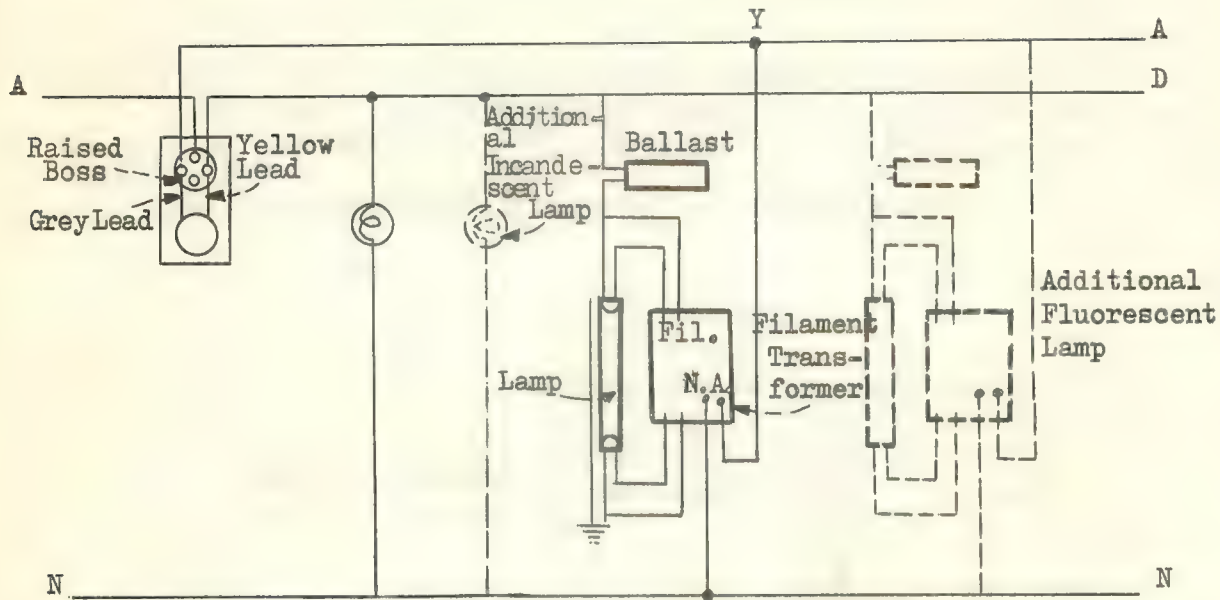


FIG.2: FLUORESCENT LAMPS

CUSTOMERS' INSTALLATIONS

Item No. 47 (Cont'd.)



ITEM NO. 48 HOUSING COMMISSION TENANTS - FAULTS ON
INSTALLATIONS

The Housing Commission is responsible for any repairs to the installations of Housing Commission rented (not sold) properties, and their Maintenance Section readily authorises the carrying out of any necessary repairs when faults occur on the electric installation.

However, in order to keep adequate control of the cost of repairs which have to be done, it is desirable that one of their officers be informed of the extent of the work to be done before the work is commenced.

Emergency Service Officers who become aware that the residence is Housing Commission rented property when visiting customers' premises, and find that the services of an electrical contractor will be required to carry out repairs to the installation, or where it is advisable for a temporary service to be installed, shall act as follows:-

During Normal Working Hours

The customer should be advised to telephone the Housing Commission of N.S.W. Head Office at Mark Foy's Building, 302 Castlereagh Street, City, on telephone number 2 0981 and ask for extension 200, 201, 202, or 203.

Outside Normal Working Hours

If the customer is not considerably inconvenienced by the faulty wiring or appliance, the customer should be advised to telephone the above office during normal office hours.

If the work is of an urgent nature and the customer needs early attention to the fault, the customer should be advised to telephone 61 3144, which is an answering service, and explain what is required.

The answering service can make the necessary arrangements for repairs and hand the work to a selected contractor for immediate attention, if this is desirable.

Note: For repair of electric radiators, with particular reference to Housing Commission tenants, see Section 1, page 9, item 5.

SECTION NO. 14

ELECTRIC SHOCK WITH OR WITHOUT INJURY OR FATALITY

Item No. 1. No Access to Inspect

2. Cause of Shocks Ascertained
3. When Shocks Can Be Received But the Cause Cannot Be Ascertained
4. Reported Severe Shock - Cause Not Apparent
5. Reported Minor Shock - Cause Not Apparent
6. Energised Property, Fences, Rails etc.
7. Tests And Inspections For Shocks
8. Disconnection of Apparatus or Installation
9. Reporting Results of Investigations
10. Action to be Taken By Officers Visiting Premises
Where Fatality or Injury Has Occurred
11. Restoration of Supply After Disconnection
for Shock
12. Reports of Energised Electricity Poles
13. Fallen Mains Lodged on Vehicles (Potential Shocks)
14. Shocks Received - Earth Connection Removed By Plumber

SECTION NO. 14. ELECTRIC SHOCK WITH OR WITHOUT INJURY OR FATALITY

1. No Access to Inspect

When an officer visits a customer's premises or a location to investigate the existence of a reported hazard and he is unable to gain access to the premises or the location to make an inspection he shall, if possible, disconnect the installation concerned.

2. Cause of Shocks Ascertained

When an officer is able to ascertain the cause of an electric shock he shall, if practicable, rectify the defect. (See, however, item 10 referring to fatal accidents.) If it is not practicable to rectify the defect the following action shall be taken:-

- (a) Disconnect and label the apparatus, installation or portion of the installation that is defective.
- (b) Warn the customer that the apparatus or installation must not be reconnected or used until the fault has been rectified.
- (c) Refer the customer to an electrical contractor or the manufacturer of the apparatus, or inform the customer that an officer of The Sydney County Council will attend if the class of apparatus is that which is normally serviced by the Electricity Development Branch. (See Section No. 1 headed "Servicing of Electrical Apparatus by The Sydney County Council".)

3. When Shocks can be Received but the Cause Cannot be Ascertained

In cases where shocks are apparent but the cause cannot be ascertained officers will act as follows:-

- (a) Disconnect the apparatus, installation or portion of the installation thought to be defective and definitely ascertain that shocks can no longer be received, then label the disconnected apparatus or installation.
- (b) Warn the customer that the apparatus or installation must not be reconnected or used until the fault has been rectified.
- (c) Refer the customer to an electrical contractor or the manufacturer of the apparatus; or if the class of apparatus is that which is normally serviced by the Electrical Installation Branch or the Electricity Development Branch and further investigation is considered advisable, inform the customer that an officer of The Sydney County Council will attend to conduct further investigation.

4. Reported Severe Shock - Cause Not Apparent

If an officer is unable to ascertain any cause for reported electric shocks and shocks are not apparent at the time of inspection, but it can be established that a severe shock has been received, the following action shall be taken:-

- (a) Disconnect and label the suspected apparatus, installation or portion of the installation.
- (b) Warn the customer that the apparatus or installation must not be reconnected or used until further inspection has been made. The further inspection shall be made by The Sydney County Council, either by the Electrical Installation Branch, or the Electricity Development Branch, if the class of apparatus is that which is normally serviced by that Branch, and the customer will be advised accordingly.

5. Reported Minor Shock - Cause Not Apparent

When unable to ascertain any reason for the reported electric shock and no fault is apparent at the time of inspection and it can be established that the shock received was only of a minor nature, or there is doubt as to whether a shock has been received, officers will act as follows:-

- (a) The apparatus or installation shall be left connected.
- (b) The customer will be informed that no fault is apparent, but that arrangements will be made for an inspector of The Sydney County Council to conduct further tests. The further inspection shall be made by the Electrical Installation Branch, or by the Electricity Development Branch if the class of apparatus is that which is normally serviced by that Branch.

6. Energised Property, Fences, Rails etc.

Officers investigating reports that property, fences, rails, etc. are energised shall locate and, where practicable, remove the defect causing the property to be energised.

If the defect cannot be removed, the circuit or circuits affected must be disconnected and labelled. When the property energised is adjacent to a public

6. (Contd)

thoroughfare or an occupied place and the officer attending is unable to make the energised property safe, he shall contact the Despatch Officer Co-Ordination without leaving the vicinity, if this is possible, and then act in accordance with the directions received from the Despatch Officer Co-Ordination.

If it is not possible to contact the Despatch Officer Co-Ordination by radio or other means without leaving the vicinity of the hazard, the officer attending shall attempt to obtain the assistance of some suitable person willing to stand by and warn other persons of the danger whilst he is absent for the purpose of contacting the Despatch Officer Co-Ordination.

7. Tests and Inspections for Shocks

An officer investigating reports of electric shocks shall make every endeavour to ascertain the cause of the shocks and remove the hazard.

The apparatus or installation must be inspected and tested for effective earthing and, if necessary, an inspection will be made of the conductors at the point of attachment.

8. Disconnection of Apparatus or Installation

The disconnection of faulty or suspected apparatus or installations shall be made as set out in Section No. 13, Item No. 30, headed "Labelling of Defective Circuits or Apparatus".

If the conductors at the point of attachment appear to be unsatisfactory, then the disconnection shall be made at the point of attachment.

The method of disconnection must be fully recorded on the Service Report.

In cases covered by Items Nos. 2, 3 and 4, the apparatus or installation shall be disconnected, even though the customer will be inconvenienced by such disconnection.

9. Reporting Results of Investigations

An officer investigating a report of electric shocks shall, where necessary, inform the Despatch Officer Co-Ordination of the result of the investigation, and the action taken, immediately after completion of the investigation. In cases where disconnection is made, the extent to which the customer is inconvenienced shall also be reported to the Despatch Officer Co-Ordination.

Prompt reporting will avoid delay in arranging for further action which may be deemed necessary in any particular case.

In addition to the verbal report, the officer shall record on his daily run sheet detailed particulars including the circumstances prevailing at the time the shocks were experienced.

The Despatch Officer Co-Ordination shall, upon receipt of the verbal report of the officer conducting the investigation, notify the Electrical Installation Branch or the Electricity Development Branch if any further action is required by either of these Branches.

Should the Electrical Installation Branch or the Electricity Development Branch be unattended at the time of receipt of the verbal report and the customer is considerably inconvenienced, the matter shall be referred to the System Operator who will decide whether it is desirable to call out staff specially to attend.

10. Action to be Taken by Officers Visiting Premises Where Fatality or Injury has Occurred

Officers visiting premises where a fatality or injury to a person has occurred should bear in mind that the object of their visit is, firstly to ensure that no dangerous conditions are still existing, secondly, to make contact with the parties concerned and obtain sufficient information to enable the Electrical Installation Superintendent to determine when and how the investigation shall be carried out and, thirdly, to ensure that the installation and equipment is disturbed as little as possible pending that investigation. Accordingly they shall observe the following requirements:

- (a) Any dangerous condition found shall be made safe, preferably by withdrawing the fuse of the circuit concerned. In so doing, officers shall be careful to avoid disturbing the installation and apparatus any more than necessary and to record their actions and observations so that no evidence likely to assist the subsequent investigation will be lost. Unless they receive specific direction to do so, officers must not dismantle equipment or disturb connections of flexible cords or accessories (plugs, etc.). Where any disconnection is unavoidable, particular care should be taken to label or identify wiring which is disconnected, to ensure that reconnection could be made later if necessary in the same way as the original connection, e.g.:

Shocks10. (Cont'd.)

- (i) When disconnecting at the point of attachment, label each service line and customer's service wire to ensure that the original connection could be remade.
- (ii) When any other wiring is disconnected, it should be similarly labelled or identified.
- (iii) A two-pin plug in a socket should be marked with a light scratch across plug and socket before the plug is removed to indicate which way the plug was inserted. A lampholder adaptor and lampholder should be marked in a similar manner.
- (iv) Where a 2-way plug socket adaptor is involved, the particular "face" of the adaptor into which the plug was inserted should be identified with a light scratch or mark on that face.
- (b) Record the name and sex of the deceased or injured person.
- (c) If a Police Officer in charge of investigation is present at the scene of the occurrence, record his name and rank and the Police Station to which he is attached.
- (d) If the Police Officer wishes to take away any equipment, ask him to ensure that it is not disturbed in any way until after examination by the Installation Inspector.
- (e) Record any statements made, and the name of the person making the statement.
- (f) When all information has been gained, contact the Despatch Officer Co-Ordination and through him, the Electrical Installation Superintendent, Assistant Electrical Installation Superintendent or Supervisor Installation Inspections, if available and give a verbal report.
- (g) Carry out any further work that may be specifically directed. If an officer of the Installation Branch arrives at the premises before the officer of the System Operation Branch leaves, the Installation Branch Officer will assume responsibility for the investigation, and the officer of the System Operation Branch shall make available all the information obtained to that time, including statements made by any other person present.

11. Restoration of Supply After Disconnection from Shock

Officers of the System Operation Branch may restore supply to premises disconnected by Emergency Service Officers on account of shocks, provided that the necessary repairs have been carried out and that the installation is safe.

12. Reports of Energised Electricity Poles

The System Operator is primarily concerned with dealing with reports of "live" poles although on occasions it may be necessary for an Em.S.O. to be initially despatched to such a job for public safety purposes to keep people away.

Should an Em.S.O. have to attend when there have been reports of persons receiving shocks at or adjacent to an electricity pole, officers must exercise great care in their approach to the pole as a voltage gradient of dangerous value can extend for some considerable distance from the pole. At about 30 ft. from the pole, test the ground with a neon test pencil and if a positive test is obtained, do not move any closer and stand by to warn the public to keep clear.

If the test is negative, approach the pole by means of shuffling; do not step, as the voltage difference between two points on the ground a pace apart could be high enough to pass a current sufficiently high to cause damage to a human being. The System Operator should be informed by the Em.S.O. of the conditions found at the pole being checked.

13. Fallen Mains Lodged on Vehicles (Potential Shocks)

Officers from time to time, when attending calls for fallen S.C.C. mains, will find that the conductors have fallen and lodged on stationary motor vehicles. These vehicles may or may not contain persons, and may also have been involved in collision with Council's overhead construction (e.g. pole) so that the persons in the vehicle are injured as well as being trapped.

Every job should be treated by the officer attending in accordance with the circumstances prevailing. The mains involved could normally operate at 6600 volts or above, or at low voltage, e.g. 415/240 volts.

When mains which normally operate at voltages of 6600 volts or above are brought down by bad weather conditions or external damage, the chance of the mains remaining energised is remote but should be considered as a possibility, while low voltage mains could remain energised if they are supported above ground level by such things as tree branches, motor vehicles, etc.

Reports of vehicles striking poles or fallen wires are normally referred to the System Operator and he arranges attendance by Operating and Mains Branch personnel.

However, should an Emergency Service Officer attend a call where S.C.C. mains have fallen and are on the ground or across a vehicle, he should exercise extreme care in his approach to the location.

He must first ascertain by visual inspection of the poles and insulators whether high or low voltage mains are involved.

Should he determine that high voltage mains are affected, his responsibility then is to radio details to the System Operator and to proceed to safeguard the general public by warning people to keep clear until a District Operator arrives. Emergency Service Officers are not fully equipped for such work and should not normally attempt to handle high voltage mains.

Emergency Service Officers can deal with fallen "live" low voltage mains when identified as such and can make these safe by either tying these out of reach or cutting them away.

If circumstances urgently required action, for example where injured persons are trapped in a car and high voltage mains were lying across the car, recourse should be made by the Emergency Service Officer to use of the extension ladder as a "link stick" and using rubber boots, rubber gloves, dry rope, etc. to move the mains in safety.

14. Shocks Received, Earth Connection Removed by Plumber

Officers investigating shocks at customers premises and finding that the earth connection had been removed by a plumber, shall, if possible make a temporary earth connection and ascertain that shocks can no longer be received.

Refer to Contractor N.O. 1560 card also mark message X on Run Sheet referring to Electrical Installation Superintendent as required in B.S.I. 5057 and explained in Technical Instruction Book, Section 13, Item 33, Sub Section 4.

I N D E X

SECTION NO. 15

FIRES

ITEM NO. 1

Fires At Customers' Premises

1. All Premises Affected by Fire to be Visited.
2. Means by Which Advice of Occurrence of Fires is Received.
3. Co-operation With Officers of the Fire Brigade.
4. Action to be Taken on Receipt of Direct Advice of Occurrence of Fire.
5. Fires Affecting the Electric Supply.
6. Procedure to be Followed by Officers Attending Fires.
7. Maintenance of Supply.
8. Officers Inspecting for Damage by Fire.

2.

Fire Fighting Equipment - Maintenance and Operation

1. Responsibility of Fire Officer.
2. Misuse of Fire Fighting Equipment.
3. Reporting Used or Defective Fire Fighting Equipment.
4. Replacement of Used or Defective Fire Extinguishers.
5. Operation of New Type Extinguishers Mounted in System Operation Branch Vehicles.

3.

Fires Affecting Buildings and Other Property of The Sydney County Council (excluding meters etc. Installed at Customers' Premises)

1. General.
2. Responsibility of Fire Officer.
3. Officers Attending Fires Affecting Buildings or Other Property of The Sydney County Council.
4. Fires on Motor Vehicles.

SECTION NO. 15FIRESITEM NO. 1 - FIRES AT CUSTOMERS' PREMISES1. All Premises Affected By Fire to be Visited

An officer of the System Operation Branch must attend in all cases when notification is received that a fire has occurred in premises connected to The Sydney County Council's reticulation network in order that:-

- (a) Any electrical hazard may be removed.
- (b) All reasonable assistance may be rendered to officers of the Fire Brigade engaged in fire fighting.
- (c) The mains and apparatus and any other property of The Sydney County Council may be checked for possible damage by fire, water or other agency and prompt action taken to effect repair or replacement and to render any charges to customers so that their negotiations with Insurance Companies may be facilitated.
- (d) Supply may be restored promptly in cases of interruption.
- (e) Assistance may be rendered to customers inconvenienced by damaged installations or apparatus.

2. Means by which Advice of Occurrence of Fires is Received

The Sydney County Council is notified of the occurrence of fires by any of the following means:-

- (a) Telephone communication direct from customers.
- (b) Telephone advice from Fire Commissioners' officers direct to the System Operator at the time of the occurrence.
- (c) Daily reports from the Fire Commissioners of fires occurring in the Metropolitan Area.

3. Co-Operation with Officers of the Fire Brigade

When necessary, Fire Brigade Officers will contact the System Operator and request that arrangements be made for the removal of electrical hazards.

It is of major importance to the interests of the community that no effort be spared that would reduce the duration of a fire or remove electrical hazards. Consequently, officers of the System Operation Branch shall render every reasonable form of assistance to members of the Fire Brigade engaged in combating fire.

ITEM NO. 1 - FIRES AT CUSTOMERS' PREMISES (CONT'D)

The assistance of officers of the System Operation Branch will be sought by officers of the Fire Brigade mainly for the removal of electrical hazards, but officers shall also, when requested by the Fire Brigade Officer-in-Charge at the scene of the fire, convey urgent messages to and from Fire Brigade Headquarters and render any other assistance that may reasonably be requested.

4. Action to be Taken on Receipt of Direct Advice of Occurrence of Fire

When advice of a fire at a customer's premises is received either from customers or direct from the Fire Commissioners' officers, arrangements shall be made for the premises to be visited at once by either a District Operator or an Emergency Service Officer.

Details of information received and action taken shall be entered on a Service Request Card which shall be endorsed with the "Fire" stamp.

5. Fires Affecting the Electric Supply

If a fire is likely to be serious an officer of the Fire Brigade will request the System Operator to disconnect the electric supply by removal of the service fuses or section of the distributor or by an operation at the local distribution centre, or the System Operator may be requested to arrange for staff to stand-by ready to disconnect the electric supply should such a course prove necessary.

When the System Operator is obliged to call upon staff to disconnect, or to arrange for staff to stand-by for the purpose of disconnecting the electric supply to premises which are on fire, such staff may be instructed to stand-by until the fire is extinguished. The System Operator shall be kept informed of the progress of fires which are likely to affect other premises or the local street mains.

Upon receipt of advice from any source that a fire is likely to affect the street mains the System Operator shall, in addition to despatching staff to disconnect the electric supply, arrange for an inspection to be made by the District Mains Foreman who will, if necessary, decide upon the section or sections of mains to be disconnected or upon the re-arrangement of the route to supply local customers should the mains be damaged or endangered in the immediate vicinity of the fire.

6. Procedure to be Followed by Officers Attending Fires1. Reporting to and Assisting Fire Brigade

Officers despatched to premises or any location under the emergency control of the Fire Brigade, or officers already at premises on the arrival of the Fire Brigade, shall report to the Fire Brigade Officer-in-Charge at the scene.

ITEM NO. 1 - FIRES AT CUSTOMERS' PREMISES (CONT'D.)

Officers shall not leave the scene of the fire without the consent of the System Operator and without the knowledge of the Fire Brigade Officer-in-Charge at the scene.

Officers attending fires shall comply as far as possible with the procedure outlined in paragraph No. 8 of this item - "Officers Inspecting for Damage by Fire". In any case, care shall be taken to indicate whether further attention is required.

7. Maintenance of Supply

Whilst it is the policy of The Sydney County Council to co-operate in all possible ways with officers of the Fire Brigade, it must be recognised that, while it is the duty of the Fire Brigade to extinguish fires, it is the duty of The Sydney County Council to maintain the electric supply.

No officer of the System Operation Branch shall agree to interrupt supply unless he is satisfied that the interruption is necessary to enable circumstances existing at the time to be dealt with.

8. Officers Inspecting for Damage by Fire

Officers visiting premises to check for fire damage shall:-

- (a) Check the electrical installation and associated apparatus and equipment, including Sydney County Council mains and apparatus, for damage by fire, water or other agency and take any necessary action for the removal of electrical hazards, drawing service fuses or disconnecting at point of attachment, if necessary to render safe.
- (b) Return full details ~~of~~ Run Sheets of the extent of any damage to the customer's or The Sydney County Council's electrical apparatus or equipment, being particular to return the serial number, size, type and readings of any meters which may have been affected and to show whatever action has been taken or is required in regard to the installation, making use of the relevant codes.

ITEM NO. 2 - FIRE FIGHTING EQUIPMENT - MAINTENANCE AND OPERATION

1. Responsibility of Fire Officer

The Fire Officer, through the Workshops Superintendent, is responsible for the maintenance of all Sydney County Council fire-fighting equipment. He must be notified when any such equipment has been used, damaged or is otherwise in need of attention.

ITEM NO. 2 - FIRE FIGHTING EQUIPMENT - MAINTENANCE AND OPERATION (CONT'D)2. Misuse of Fire Fighting Equipment

Clothing or other materials must not be hung or deposited upon fire fighting appliances and material or plant must not be stacked or stored in a manner which will render these appliances difficult of access or hide them from view.

Any officer proved to have tampered with or misused any of The Sydney County Council's fire-fighting equipment will be severely dealt with.

3. Reporting Used or Defective Fire Fighting Equipment

Officers of the System Operation Branch who have occasion to use Sydney County Council fire-fighting equipment or who notice that such equipment is defective, whether the equipment is fixed in a Council building or a System Operation Branch Vehicle, shall act as follows:-

- (a) District Operators - report immediately to the Assistant System Operator.
- (b) Emergency Service Officers - report immediately to the Despatch Officer - Co-Ordination.
- (c) Head Office Staff - report immediately to the Despatch Officer - Co-Ordination.

On receipt of verbal notification that fire-fighting equipment has been used or is defective, the Assistant System Operator or Despatch Officer - Co-ordination, shall record the following information on a Service Request Card:-

- (a) Date on which equipment was used or found to be defective.
- (b) Name of officer from whom report was received.
- (c) Details of defective or used equipment and state of equipment after use.
- (d) Description of circumstances under which equipment was used and whether used on Sydney County Council or private property.
- (e) Present whereabouts of defective or used equipment.
- (f) Any other information that may be of assistance to the Fire Officer.
- (g) Date and time of receipt of report.

The Service Request Card shall be addressed "Sydenham Depot/WS" and forwarded on the next working day. The officer forwarding the card shall also telephone Sydenham Depot to advise of the location of the spent extinguisher.

ITEM NO. 2 - FIRE FIGHTING EQUIPMENT - MAINTENANCE AND OPERATION (CONT'D)4. Replacement of Used or Defective Fire Extinguishers

When the fire-fighting equipment involved is mounted in a System Operation Branch Vehicle, the officer concerned shall, at the first opportunity, replace the discharged or faulty extinguisher cylinder from spares kept at the depots at Sydenham (3), Burwood (2), Miranda (2), Pymble (2) and City (2). When replacing the cylinder, a label shall be attached to the returned unit identifying its previous location.

The spent cylinder shall be duly collected by a System Operation Branch lorry driver and taken to Sydenham Depot from where it will be collected by staff of the Fire Officer's section.

When the fire-fighting equipment involved is fixed in a building, the replacement will be attended to by staff of the Fire Officer's section.

The Supervisor - Emergency Service Officers shall include a check of all extinguishers whilst carrying out the periodical check of other equipment carried on vehicles.

When an extinguisher is found to be missing, the Fire Officer shall be notified immediately.

The Workshops Superintendent will furnish the Operating Engineer with full details of the missing extinguisher to enable a thorough investigation to be made.

The Workshops Superintendent shall be notified of the result of the investigation and in those cases where the extinguisher cannot be located, he will obtain approval by Signed Order for the extinguisher to be written off the records and for its replacement if necessary.

When a replacement for a lost extinguisher is required, the Operating Engineer will issue an Inter-Branch Order on the Workshops Superintendent for its supply and installation. During the periodical checks of equipment on vehicles, extinguishers found damaged or partly or fully discharged shall be fitted with replacement cylinders from stocks maintained at depots listed ^{below.} _{above}

5. Operation of New Type Extinguishers Mounted In System Operation Branch Vehicles

The extinguishers mounted in System Operation Branch vehicles are known as 2 lb B.C.F. extinguishers. (B.C.F. stands for Bromochloridefluoromethane) The unit consists of an operating head and an exchangeable cylinder. Spare cylinders are located at certain depots as outlined previously.

To operate the extinguisher, release the safety catch in the direction indicated by the red arrow and fully depress the squeeze grip control. To stop

discharge, release the pressure of the squeeze grip control. The full discharge period of the extinguisher is approximately ten (10) seconds.

When operated, a red disc in the head of the extinguisher ruptures, indicating that the extinguisher has been used.

To recharge the extinguisher, ensure that the charge is fully expended by operating until the vaporised B.C.F. ceases to flow, unscrew the empty cylinder from the operating head and replace with a full spare cylinder. The head should be firmly screwed to the full cylinder.

A new red indicating disc supplied with each replacement cylinder is stored beneath the transit cap which protects the frangible (capable of being broken) pin.

NOTE: Care should be taken that the disc is not lost when removing cap.

ITEM NO. 3 - FIRES AFFECTING BUILDINGS AND OTHER PROPERTY OF THE SYDNEY COUNTY COUNCIL (EXCLUDING METERS ETC. INSTALLED AT CUSTOMERS' PREMISES)

1. General

This Item deals with fires affecting buildings and other property of The Sydney County Council but it does not concern meters, etc., affected by fires at customers' premises as these are covered by Item No. 1 of this Section.

2. Responsibility of Fire Officer

The Fire Officer, through the Workshops Superintendent, being responsible for all fire-fighting appliances and equipment must be notified when any such equipment is used whether used for Sydney County Council purposes or otherwise. He must also be notified of all fires affecting Sydney County Council premises or other property of The Sydney County Council.

3. Officers Attending Fires Affecting Buildings or Other Property of The Sydney County Council

(i) Officers who attend fires affecting premises or other property of The Sydney County Council shall, in addition to giving a verbal report to their Section Supervisors after the necessary emergency action has been taken, submit a written report giving the following information:-

- (a) Time, date and location of fire.
- (b) Description of and damage caused by fire.
- (c) Cause of Fire.
- (d) Details of fire-fighting appliances used and their condition after use.

ITEM NO. 3 - FIRES AFFECTING BUILDINGS AND OTHER PROPERTY OF THE SYDNEY
COUNTY COUNCIL (EXCLUDING METERS ETC. INSTALLED AT CUSTOMERS'
PREMISES)

- (e) Any other action taken.
- (f) Any suggested action which, in their opinion, would prevent, or more effectively deal with, a similar occurrence.
- (ii) After general working hours the verbal report shall be made to the System Operator who will, after taking any further action required, arrange for the Fire Officer to be notified at his home or at 9.00 a.m. the next general working day, dependent upon the circumstances.

4. Fires on Motor Vehicles

Fires affecting Sydney County Council Motor Vehicles must be reported to the Fire Officer and the Transport Superintendent as early as possible after the necessary emergency action has been taken. A Motor Vehicle Accident Report must also be prepared.

SECTION NO. 16 (CONT'D)

Item No.3. Reconnections After Hours.

1. General.
2. Priority for Reconnections After Hours.
3. Premises Disconnected Apparently in Error.
4. Reconnection of Vacant Premises.
5. New Installations.
6. Reconnection After Disconnection by Officers of the Installation Inspection Branch.
7. Customers Requesting Cancellation of Disconnection or Final Reading.
8. Reconnection After Disconnection for Default of Payment of Money Due.
 - (i) Premises Found Disconnected for Default.
 - (ii) Premises Where Supply May Not be Reconnected.
 - (iii) Sickness or Extreme Emergency.
 - (iv) Premises Disconnected After Payment of Account or Deferment of Payment.
 - (v) Terminology.
 - (vi) Receipt of Money by Officers of the System Operation Branch on Behalf of The Sydney County Council.
9. Apparent Neglect By The Sydney County Council to Connect Supply as Arranged.
10. Reconnection After Repairs.

Item No.4. Reconnection After Disconnection by Officers of the Installation Inspection Branch.

1. Disconnection by Installation Inspection Branch.
2. Installations that May Be Reconnected By The Emergency Service Section After Hours.
 - (i) Disconnection For Failure To Give Access for Initial Inspection.
 - (ii) Disconnection for Minor Defects or Because of Failure to Give Access for the Inspection of Rectified Defects.
 - (iii) Procedure to be Followed by Emergency Service Officers Reconnecting Supply.
3. Installations That Must Not Be Reconnected.
4. Installations Found to Have Been Disconnected by the Installation Inspection Branch.

SECTION NO.16 -- DISCONNECTION AND RECONNECTION OF ELECTRIC SUPPLY

GENERAL -- REMINDER CARD CARRIED IN EM.S.O's. REPORT FORM FOLDER

A card known as Form.180 shall be carried in Emergency Service Officers' Report Form Folders as a general reminder of the basic requirements of the Customers'Accounts Section in regard to Disconnections and Reconections.

Sample card details below:-

CUSTOMERS ACCOUNTS SECTION -- REQUIREMENTS REGARDING WORK

"VACANT PREMISES": Premises found vacated -- no knowledge of new occupant.

Leave supply connected if domestic premises without storage hot water installation.

Disconnect supply to commercial and industrial premises and if installation or fixed appliance considered unsafe or for other good reasons.

"DO NOT RECONNECT": If attending for "no light or power" and supply found to have been disconnected and marked "do not reconnect", radio Head Office for instructions.

"CHECK RECEIPT": If instructed "check receipt" record the customers name and the code number and date and amount of payment and receipt number.

"RECONNECTION OF SUPPLY -- NEW CUSTOMER": If attending for reported "no supply" and find new customer in occupation, connect supply and obtain and record:-

- (a) full name of new customer
- (b) Whether owner or tenant
- (c) if previously a customer of Council, at what address
- (d) if electric range installed, of what rating

(Should it be necessary to complete any documents, customer will be advised by letter)

FORM 180 (to be retained in Em.S.O's. Report Form Folder),
.....

ITEM NO.1 -- DISCONNECTION OF ELECTRIC SUPPLY

1. General

This item details general procedure concerning disconnection of supply but does not deal with disconnections at the point of attachment which are covered by Section No.12 headed "Customers' Service Wiring".

The following Branches disconnect the electric supply at customers' premises:-

(i) Treasury.

- (a) When premises are to become vacant.
- (b) After default of payment of money due to The Sydney County Council for security deposit, electricity used, or other charges.

(ii) Installation Inspection Branch

- (a) Because of faulty installation.
- (b) For such other reason as the Chief Installation Inspector considers necessary.

(iii) Mains Branch

- (a) At point of attachment or pole connections in cases of faulty service lines or service wiring.
- (b) At the request of the Treasury or Installation Inspection Branch in special cases.

(iv) System Operation Branch

- (a) At the request of customers at any time for repairs.
- (b) When dangerous defects are discovered whilst attending premises during the course of duty.
- (c) At the special request of customers after hours when premises are to be vacated.
- (d) At the request of the Customers' Accounts Section when Treasury Officers cannot gain access to disconnect for default of payment of money due to The Sydney County Council, or when premises are to become vacant.
- (e) On instructions from the Chief Installation Inspector.
- (f) In any other circumstances covered by Branch Standing Instructions.

2. Method of Disconnecting Supply

Except in the case of disconnection at point of attachment, disconnection of the electric supply shall be made at the service fuses or connecting links, but where it is impracticable to disconnect at the service fuses or connecting links, the load side leads must be withdrawn from the meters.

Where disconnection is made at the service fuses, the service fuses are to be sealed either to the outside of the appropriate fuse boxes or to some portion of the property of the Sydney County Council at or near the service fuses. They will be secured so that the sealing wire must be broken before the fuse can be detached from its temporary location. This procedure does not apply in the case of 70 amp. fuses which are removed from the premises.

In order to reduce the risk of loss by theft, unless otherwise instructed, neutral service links associated with disconnected electric supply will be left undisturbed.

3. Disconnections Made By Cutting Wires From Service Fuses.

When disconnection is found to have been made by cutting away wires from service fuses instead of by removing the leads from the terminals of the energy meters or maximum demand indicators, the facts shall be shown on Service Reports.

Record Cards for these cases will be referred to the Emergency Service Engineer.

4. Use Of Disconnection Slips and "Advice of Disconnection" Cards.

Emergency Service Officers about to disconnect the electric supply for any reason shall advise the customer of the impending disconnection and the reason therefor.

Upon disconnection, a Disconnection Slip (O.E.6) correctly filled in must be placed in the fuse box or meter terminal cover, according to the point at which disconnection is made.

If the customer is not on the premises a note, signed by the Emergency Service Officer, to the effect that supply has been disconnected is to be made on a "Further Work" Card (O.E.28) (No.1560) and left on the premises for the information of the customer.

Similar procedure is followed when authorised officers of the Treasury and the Installation Inspection Branch disconnect supply - See also Paragraph No.8 "Disconnections for Default".

An Emergency Service Officer attending premises in response to a request for service and finding that the electric supply has been disconnected without a Disconnection Slip having been left at the point of disconnection shall, in addition to reporting to the Despatch Officer, recover the seals from the point of disconnection and forward them, attached to the Service Report, to the Despatch Officer.

5. Despatching

Despatch Officers issuing disconnection jobs shall acquaint officers to whom the work is being allotted with the reason for disconnection. Where desirable for positive identification of the service concerned, such as in blocks of flats, the meter numbers shall be given to the officer.

6. Meter Numbers and Readings.

The numbers and readings of the meters associated with the installation are to be recorded on Service Reports whenever an Emergency Service Officer disconnects the electric supply.

7. Disconnections for Repairs

The disconnection and the subsequent reconnection of supply to enable customers to have their installations repaired will be done by the Emergency Service Section at any hour free of charge. See Section No.13, Item No.14 headed "Disconnection For and Reconnection After Repairs".

8. Disconnections for Default.

- (i) The Treasury will disconnect supply to premises of customers defaulting in payment of accounts for security deposit, electricity used or certain other charges.
- (ii) As a general rule, supply will not be reconnected until the amount due plus a reconnection fee of 10/- is paid by the customer, but after hours the Emergency Service Section may arrange to reconnect supply in accordance with the provisions of Item No.3 headed "Reconnections after Hours."
- (iii) Treasury Officers disconnecting supply for default of payment of an account always leave for the information of the customer, a card showing the date and reason for the disconnection and the total amount, including any reconnection fee, owing. These "Advice of Disconnection Cards" vary in colour according to the reason for disconnection as is shown below:-
 - (a) Yellow - for non payment of account for electricity used
 - (b) Buff - for non payment of security deposit.

9. Disconnections by Installation Inspection Branch

See Item No.4 headed "Reconnection after Disconnection by Officers of the Installation Inspection Branch."

10. Premises Found Disconnected

See Item No.3 headed "Reconnection of Supply - General" and "Reconnections after Hours."

11. Disconnections after Hours - At Request of the Treasury or the Chief Installation Inspector.

Authorised officers of the Treasury may request the Emergency Service Section to disconnect supply after hours where access to disconnect for default cannot be gained during working hours; or the Chief Installation Inspector may request a disconnection for a particular reason.

It is obligatory on Emergency Service Officers to disconnect supply when instructed to do so. If emergency circumstances are revealed at the time of a visit to disconnect, the Emergency Service Officer shall report the circumstances to the Despatch Officer who will determine the action to be taken.

12. Final Meter Readings taken after Hours - Requests from customers.

Should a customer request that a Final Meter Reading be taken outside of general working hours for some reason that prevents its being taken during working hours, the address to which the account may be forwarded is to be obtained from the customer and arrangements will be made for an Emergency Service Officer to read the meter, subject to satisfactory proof that the person making the request is the customer of The Sydney County Council.

Supply will be disconnected if the premises are being left vacant.

If the premises are being re-occupied, supply will not be disconnected, but the Emergency Service Officer will record on the Service Report the available information as to the details of the new occupant, as set out in the section "Reconnection of Supply - New Customer" of Form 180 carried in Emergency Service Officer's Report Form Folder. (See the general item at the front of this section).

Record Cards showing meter readings and full information concerning both the old and the new occupants shall be addressed to the Customers' Accounts Section (Accts.).

13. Disconnections by or at Request of Landlords -

(a) Where the Owner is the Customer.

In some cases, The Sydney County Council meters a block of flats and renders all accounts to the owner of the flats who, as the customer of The Sydney County Council, pays the aggregate amount and obtains from the tenants payment for the electricity they use, the arrangement between owner and tenant being merely a private one.

Should the owner of premises metered in this manner request after hours that a flat be disconnected for some special reason, disconnection may be arranged subject to satisfactory proof that the person who requests the disconnection is the customer of The Sydney County Council.

Persons who are not customers of The Sydney County Council complaining that an owner has disconnected their flats are to be advised that The Sydney County Council cannot mediate between owner and tenant and that the matter is one on which tenants might seek the advice of their legal adviser.

(b) Where the Tenant is the Customer.

Where the tenants of residences or flats are the customers of The Sydney County Council, requests from the owner to disconnect supply will not be complied with except with the permission of The Sydney County Council's customer, unless the owner makes a request in writing for the removal of all The Sydney County Council's mains or apparatus from the premises.

If a tenant who is the customer of The Sydney County Council complains that the owner has disconnected supply from the tenant's premises, every endeavour will be made to restore supply as it is the responsibility of the Sydney County Council to maintain supply to its customers with reasonable continuity.

SECTION NO. 16ITEM NO. 2 RECONNECTION OF SUPPLY - GENERAL1. General

This item deals with the general procedure concerning the reconnection of supply at customers' premises. The other items in this Section should be studied in conjunction.

Reconnection of supply at point of attachment is dealt with in Section No. 12 headed "Customers' Service Wiring".

The Emergency Service Section will reconnect supply at customers' premises by replacing service fuses, the connecting links or meter leads at the request of:-

- (a) The Customers' Accounts Section of the Treasury when premises are to be re-occupied or when satisfactory financial arrangements have been made between customers and the Treasury after disconnection for default of payment of money due for security deposit, electricity used, or other charges.
- (b) The Chief Installation Inspector for any reason.
- (c) Customers both during and outside of general working hours in accordance with the provisions outlined in this and allied items in this Section.

2. Terminology

Reconnections after disconnection for default of payment of money due to The Sydney County Council shall be referred to in conversations between officers of the System Operation Branch as "Type "D" Reconnections". No reference to disconnection for default shall be made.

This applies to all conversations including those over the telephone or radio.

3. Order of Priority for Reconnections

All reconnections of supply to rate equal in urgency with their respective "class of job" code during normal hours.

After hours Code 4 replaces will decrease in urgency, however, on enquiry from a customer these replaces shall be given "Commercial Priority".

(ii) Premises Disconnected Apparently in Error.

Officers visiting premises and finding that the electric supply has been disconnected for no apparent reason shall report particulars of the Disconnection Slip or Seals and all other available facts to the Despatch Officer at once.

During ordinary office hours, the Despatch Officer shall refer the question to the Customers' Accounts Section or the Installation Inspection Branch as is necessary and shall act as requested.

After ordinary office hours, the Despatch Officer shall act as circumstances dictate. If the Despatch Officer is satisfied that disconnection could have been made in error, and if the records available do not show any reason why the supply should not be connected to the premises, he shall arrange for the immediate restoration of supply in accordance with procedure set out in Item No.3 of this Section headed "Reconnections after Hours". The Emergency Service Officer will be instructed to return the Disconnection Slip or Seals for the attention of the Emergency Service Supervisor.

(iii) Premises Found Disconnected for Default.

On finding that premises have been disconnected for default of payment of money due to The Sydney County Council, Emergency Service Officers shall acquaint the customer of the reason for the disconnection. The matter must not be discussed with any other person than the customer.

~~§4-20~~

If the Disconnection Slip is not marked "Do Not Reconnect" and the customer promises to pay the whole of the amount owing plus the reconnection fee of ~~10/-~~ on the next general working day, the Officer will reconnect the supply. Payment of the whole of the amount owing must be promised - part payment cannot be considered.

After office hours, the Despatch Officer will act as is set out in Item No.3 headed "Reconnections after Hours".

(iv) Premises Disconnected by Officers of the Installation Inspection Branch

See Item No.4 headed "Reconnection after Disconnection by Officers of the Installation Inspection Branch."

(v) Premises Found Disconnected for Repairs.

See Section No.13, Item No.14 headed "Disconnection for and Reconnection after Repairs."

(vi) Premises Found Disconnected at Point of Attachment.

See Section No.12 headed "Customers' Service Wiring."

14. Reconnections at Request of the Electrical Installation Superintendent

On occasions, the Electrical Installation Superintendent will request, either by telephone or in writing, the Emergency Service Section to reconnect the whole or part of an installation.

When allotting the work to an Emergency Service Officer, the Despatch Officer Co-ordination must give the reason for the premises being disconnected, and a summary of any defects.

In any case, the Emergency Service Officer shall read any schedule of defects which may have been left at the point of disconnection and check that the defects have been corrected before re-connecting supply.

15. Reconnections at the Request of the Senior Meter Reader

When instructions have been issued by the Treasury for the disconnection of premises upon their becoming vacant and advice is subsequently received that the premises are being re-occupied by another customer but it is too late to cancel the order for disconnection, the Senior Meter Reader will telephone the Emergency Service Section where a Service Request Card endorsed "Instructions from Senior Meter Reader" shall be prepared for the reconnection of supply.

16. Receipt of Money by Officers of the System Operation Branch on Behalf of The Sydney County Council

Officers of the System Operation Branch are not authorised to collect money on behalf of The Sydney County Council and in no circumstances shall they be permitted or instructed to do so.

Customers offering payment of an account to an officer of the System Operation Branch are to be informed courteously that payment should be made at or sent to Head Office or one of the Branch Offices.

17. When Emergency Service Officers are replacing customers' supply and find that dual rate meters controlled by time switches are installed, it will be necessary in every case to check the time switches and if necessary reconnect the time switch leads.

SECTION NO. 16

ITEM NO. 3 - RECONNECTIONS AFTER HOURS

1. General

This item deals with the procedure concerning reconnections of supply arranged by the Emergency Service Staff outside of ordinary office hours.

After general office hours, Head Office Staff of the Emergency Service Section may arrange for the reconnection of supply at the request of customers in the following circumstances:-

- (a) When premises have been disconnected apparently in error.
- (b) For a customer taking over vacant premises.
- (c) When supply has been disconnected at request of a customer and altered circumstances cause the customer to require the restoration of supply for a period.
- (d) When premises have been disconnected by officers of the Installation Inspection Branch. (See Item No. 4 headed "Reconnection After Disconnection by Officers of the Installation Inspection Branch.")
- (e) After disconnection for default of payment of money due to The Sydney County Council.
- (f) When The Sydney County Council has failed to connect supply as arranged.
- (g) After disconnection by officers of the System Operation Branch for repairs.

When reconnecting supply outside of ordinary working hours, officers must pay due regard to the general provisions of all Branch Standing Instructions relating to reconnection of supply.

2. Priority for Reconnections After Hours

Reconnections arranged after ordinary office hours to rate equal in urgency with their respective "class of job" code.

3. Premises Disconnected Apparently in Error

On rare occasions, it may happen that the electric supply will be disconnected due to error on the part of The Sydney County Council's officers or due to incorrect instructions given by a customer.

When an Emergency Service Officer attending premises in response to a call for service reports that supply has been disconnected apparently

3. Cont'd

in error, all the facts including particulars of the Disconnection Slip, if any, shall be obtained by the Despatch Officer, and, if after checking available records, the Despatch Officer is satisfied that disconnection has been made in error, the Emergency Service Officer shall be instructed to restore supply immediately and to return the Disconnection Slip or seals found at the point of disconnection.

4. RECONNECTION OF VACANT PREMISES

Supply may be reconnected at vacant premises after hours by the Emergency Service Section where the new occupant failed or has been unable to make arrangements with the Treasury or where arrangements have been made for reconnection but instructions have not been received from the Treasury. See also Paragraph No. 9.

5. (a) New Installations

When an Emergency Service Officer discovers an installation to be a new one that has not been inspected and passed by an Installation Inspector, he shall report immediately by radio for the information of the Despatch Officer Grade 1 (Despatch Officer - Co-ordination).

On no account must new installations be connected without the express authority of the Electrical Installation Superintendent.

(b) Flats in New Buildings

When a request is received after office hours to connect supply to a flat in a newly erected block and at the time no other flat, or the house lighting, is connected, supply shall not be connected even if all the metering has been done, unless all yellow E.I.S. warning labels (N.C. 1192) have been removed. (See facsimile of label below.)

E.I.S. (N.C.1192) LABEL
(obverse side)

THE SYDNEY COUNTY COUNCIL

WARNING:
DO NOT CONNECT INSTALLATION

This installation has been metered prior to inspection and must not be connected to the supply before this label has been removed by an Installation Inspector.

N.C.1192

K.I. BURNS
Electrical Installation Supt.

(reverse side)

THE SYDNEY COUNTY COUNCIL

(Please turn over)

The Emergency Service Request card showing full particulars shall be marked "Urgent" and forwarded to the Electrical Installation Superintendent/Customers' Accounts Section (E.I.S./Accts.) first thing next general working day.

(c) Home Units and Flats not Connected on Initial Inspection Date at the Request of the Owner

The Electrical Installation Branch has adopted an arrangement by which the owners of new blocks of flats and home units may request that the individual units or flats be left not connected when the inspection of the installation has been completed.

The Council agreed to this arrangement because sometimes these units are vacant for months before being occupied and the owners would be required to pay minimum accounts for each unit, while on other occasions the estate agents leave the lights on for long periods and the owners have to pay for the electricity used.

This arrangement applied only to premises containing more than four (4) sub-installations and, no matter how many of the units or flats are left not connected, the house lighting must be connected.

The procedure provides for either the Installation Inspector, or the Connecting Officer if the meters are installed after the inspection has been completed, to leave the load tails disconnected from the meters of the flats or units involved, and place a label I.26 on each load tail. Before attaching the label, the Installation Inspector or Connecting Officer is required to ensure that the unit or flat number is written in the place provided on the label, together with the address which should include the street number and name and the suburb, at least. (See facsimile of label below.)

E.I.S. (I.26) LABEL
(obverse side)

TO: Electrical Installation Branch/S.I.I.
THE SYDNEY COUNTY COUNCIL

○ New Customer

Meter No. Reading

Connected on byEm.S.O.

(reverse side)

To: Electrical Installation Branch/S.I.I.
INSTALLATION INSPECTED, PASSED, NOT CONNECTED

Name Unit No.

○ Address

Supply MUST NOT be connected unless so
requested by Customers' Accounts Section/
Treasury or, after hours, as directed by the
System Operation Branch.

(I.26) (Please turn over) K.I. BURNS
Stock line No. Elect. Inst. Supt.

When Emergency Service Officers come upon these labels, they are to complete all vacant sections of both sides of the labels and send them to Head Office with their Run Sheets at the end of the shift. If the Installation Inspector or Connecting Officer has failed to fill in the flat or unit number and the address, supply this information as well, as the label is of no value without this information. Report any cases where the address is missing, to the Sup.Em.S.Os. so that this can be taken up with the Electrical Installation Branch, as this information should be provided as a guide to the officer making the connection and its absence could be an embarrassment on occasions.

6. RECONNECTION AFTER DISCONNECTION BY OFFICERS OF THE
INSTALLATION INSPECTION BRANCH

See Item No. 4.

Sometimes, after a Final Reading or disconnection of supply at a customer's request, a change of circumstances such as, for example, a breakdown of arrangements for removal, may cause the customer to request after hours that supply be restored at his address.

The customer will be requested to close the main switch or an Emergency Service Officer will be instructed to reconnect supply, according to circumstances.

7. CUSTOMERS REQUESTING CANCELLATION OF DISCONNECTION OR FINAL READING

14(c)

30.11.70

8. Reconnection After Disconnection for Default of Payment of Money Due.

(i) Premises Found Disconnected for Default.

Supply may be restored by the Emergency Service Section after general office hours to premises which have been disconnected for default of payment of money due to The Sydney County Council provided that instructions have not been issued by the Treasury to the contrary and the customer promises to pay the account next working day or, in the case of stated inability or hardship, within the next three (3) days. The amount to be paid shall be the whole outstanding account plus reconnection fee of ~~10/-~~ \$4-00

(ii) Premises Where Supply May Not Be Reconnected.

Customers requesting reconnection of supply in cases where the Treasury has indicated that supply is not to be reconnected after office hours, shall be informed that the supply cannot be reconnected and will be advised to communicate with the Treasury during office hours. The reason why supply cannot be restored must not be given to the customer.

Except in the case of sickness or extreme emergency, no departure from this procedure shall be permitted unless at the specific request of the Treasurer/Assistant Treasurer or by direction of one of the following officers:-

General Manager
Chief Engineer

(iii) Sickness or Extreme Emergency.

Despite that the Treasury has specifically requested that supply is not to be reconnected and even though the customer cannot guarantee to pay the amount owing on the next working day, supply may be reconnected because of sickness or extreme emergency at the discretion of the officer at Head Office receiving the call. Satisfactory confirmation of the existence of the emergency claimed must first be obtained, for example, the attending doctor's statement that the reconnection of the electric supply is advisable.

In seeking confirmation from persons other than the customer, care must be exercised to refrain from any mention of the disconnection of supply for non-payment of an account, or security deposit.

(iv) Premises Disconnected After Payment of Account or Deferment Of Payment.

When customers who have apparently been disconnected for default can produce proof that portion or the whole of the amount due has been paid or evidence is available that payment has been deferred by the Sydney County Council, an Emergency Service Officer will be instructed to reconnect supply. If the customer states that a receipt is held for money stated as having been paid, the Emergency Service Officer will be further instructed that the receipt must be inspected before supply is reconnected and that particulars of the receipt are to be shown on the Service Report.

Production of a relevant cheque butt shall be accepted as evidence of remittance of amount stated. However, if Treasury advice of reason for disconnection is "cheque returned" claims of customer of possession of a receipt, or cheque butt, must not result in reconnection of supply.

(v) Terminology

Type "D" reconnections arranged after ordinary office hours shall be referred to in conversations between officers of the System Operation Branch as "Type D Replaces After Hours" - the words "for (or after) default" must not be used. This applies to all conversations between officers, whether over the telephone, radio or otherwise.

(vi) Receipt of Money by Officers of the System Operation Branch On Behalf Of The Sydney County Council.

Officers of the System Operation Branch are not authorised to collect money from customers on behalf of The Sydney County Council.

In no circumstances are Emergency Service Officers to be instructed or permitted to receive money from customers in payment of accounts due to The Sydney County Council.

Customers offering to pay accounts to Emergency Service Officers visiting premises on Type "D" Replaces After Hours" are to be informed politely that payments should be made at or sent to Head Office or one of the Branch Offices.

9. Apparent Neglect By The Sydney County Council To Connect Supply As Arranged.

Customers may telephone after ordinary office hours and state that supply has not been connected although:-

- (a) Arrangements were made for a transfer, or the necessary deposit for connection of supply was paid at Head Office or a suburban Showroom.
- (b) Arrangements were made by telephone during office hours, or by letter.

9. (Cont'd)

If no supply is available after the customer has closed the main switch, or if the customer is disinclined to operate the main switch, an Emergency Service Officer shall be instructed to visit the premises and to connect supply if necessary.

10. Reconnection After Repairs

When supply has been disconnected by an Emergency Service Officer for repairs, the subsequent reconnection will be made at any time on receipt of notification that repairs have been effected and the installation is ready for connection.

11. Procedure for Connection of Ranges and Storage Water Heaters(a) New installations - range and storage heater not connected.

On new installations it is common practice for the contractor to install the wiring for ranges and storage heaters, but as these appliances are liable to theft they are not being delivered until a customer moves into the house or unit.

The Installation Inspector when testing and passing the installation also inspects the range and/or storage water heater wiring and leaves a yellow card N.C. 1062 I.28. (See facsimile of label)

When an Emergency Service Officer attends to give emergency service and these conditions exist, he will not connect but refer the customer to the electrical contractor to connect the range and/or storage water heater.

The contractor can make the connection and give supply as indicated on card.

(b) Old installations - new range and storage water heater supplied and delivered by The Sydney County Council.

On an old installation where a new range or storage heater has been purchased from The Sydney County Council, the Electricity Development Branch arranges for the existing wiring to be inspected by the Electrical Installation Branch and, if in order for use with the new appliance, a Form I.133 is left for the information of the Electricity Development Branch Technician. (See form I.133)

11. (b) (Cont'd)

When delivery has been made of the new range or storage heater, customers may telephone for Emergency Service to connect the appliance.

Officer, unless otherwise directed, will refer these jobs to the Electricity Development Branch.

THE SYDNEY COUNTY COUNCIL

IMPORTANT NOTICE

Only a licensed electrical contractor is authorised to connect an appliance to this circuit wiring provided that the installation is checked for safety before connection and that the detachable portion of this notice is returned IMMEDIATELY to the Council. No stamp is necessary.

(detach here)

THE SYDNEY COUNTY COUNCIL

NOTICE OF CONNECTION OF APPLIANCE

Name

Address

.....

The electrical contractor is advised that the wiring has been tested and the circuit fuses left tied to the switch-board. The appliance to be connected may have a name plate rating not exceeding A phase amps. B phase amps. C phase amps.

See report No. for defects in wiring.

Inspector Date

TO BE COMPLETED BY ELECTRICAL CONTRACTOR

On I/we connected a
..... rated at amps to the above circuit wiring and checked the safety of the installation before connection to the supply.

Contractor

Licence No.

Access to inspect available on

NC 1062

I.28

No postage
stamp required in
if posted in
Australia

BUSINESS REPLY POST
Permit No. 361. Issued at Sydney

Postage and Fee will be paid on delivery to

The General Manager,
The Sydney County Council,
P.O. Box 4009,
SYDNEY, N.S.W. 2001

THE SYDNEY COUNTY COUNCIL

CONNECTION OR DISCONNECTION OF APPLIANCE

TO: E.D.B. CLERK NO. 31/S.I.I./E.D.B./CLERK NO. 31

Customer's name: _____

Address: _____

INFORMATION FOR E.D.B. MECHANIC

This wiring has been examined by me. A range may be connected to it. The circuit cut-outs are energised and the fuse links disconnected and sealed out.

Wiring is connected to A.B.C. Phases and Neutral.

Total element loadings permissible are:-

A. Phase _____ amps. B. Phase _____ amps. C. Phase _____ amps.

Greatest load to be connected to _____ Phase.

Date: _____

Installation Inspector

INFORMATION FOR CLERK NO. 31/S.I.I./CLERK NO. 31

I have today connected/disconnected a _____ to/from
this wiring under the following conditions.

Make _____ Type _____ Total Rating _____ kW

Total element loading connected to/disconnected from:-

A. Phase _____ kW. B. Phase _____ kW. C. Phase _____ kW.

Meter Readings Meter No. _____ Reading _____
(read all meters):-

Remarks: _____

Date: _____

E.D.B. Mechanic

Noted by _____ for S.I.I.

Noted by _____ Clerk No. 31

SECTION NO. 17

MAINS

ITEM NO. 1 - FALLEN OR DANGEROUS DISTRIBUTORS AND SERVICE LINES

1. Action to be Taken by Officers Attending a Fallen or Dangerous Wire.
2. Injuries to Persons and Damage to Property.
3. Information Concerning Cause of Failure.
4. Disposal of Wire Cut Away.

ITEM NO. 2 - OPEN CIRCUITED NEUTRAL SERVICE LINES OR CONNECTIONS AT CUSTOMERS' PREMISES.

1. Withdraw Fuses.
2. Maintaining Supply Under Special Circumstances.
3. Defective Mains Connection Boxes.

ITEM NO. 3 - OVERLOADED MAINS AND APPARATUS

1. Overloaded Mains and Apparatus Likely to Cause Fire or Unnecessary Operation of Service Fuses.
2. Overloaded Service Fuses.
3. Repeated Visits to Customers' Premises.
4. Service Greatly in Excess of Requirements.

ITEM NO. 4 - NO SUPPLY AT SERVICE FUSES

ITEM NO. 5 - REMOVAL OF SERVICES TO PERMIT OF DEMOLITION OF BUILDINGS.

ITEM NO. 6 - LOCATION OF UNDERGROUND ELECTRIC CABLES.

ITEM NO. 7 - LINE CLAMPS.

ITEM NO. 8 - DEFINITIONS

ITEM NO.1 - FALLEN OR DANGEROUS DISTRIBUTORS AND SERVICE LINES (CONT'D)

Where possible the damaged mains and apparatus must be labelled for identification and returned to a System Operation Branch Depot.

3. Information Concerning Cause of Failure

Officers attending broken distributor wires or service lines must make a reasonable endeavour to ascertain the cause of the break.

The required information might be obtained from bystanders or by examining the ends of the wires to disclose whether burning took place.

Such information as the following might be obtained:-

- (a) Kite tail on wires
- (b) Wires struck by football
- (c) Limb of tree on wires
- (d) Wires struck by flying debris
- (e) Wires burnt apart
- (f) Pole struck by vehicle

In all cases where a registered vehicle, tractor, mobile crane etc. is involved the following information shall be obtained.

Registration number of the vehicle, tractor, mobile crane etc. involved,

Driver's full name and address

Owner's full name and address

An officer may, if he considers it necessary, ask the driver of the vehicle responsible for damage to show his licence in order to verify name and address. Before doing so, however, the officer should show his identity card.

All information obtained together with particulars of any action taken by officers will be shown on a Service Report.

Where no information is available as to the cause of the break, Service Reports are to be endorsed "Cause Not Ascertained", but an opinion of the probable cause of the failure would be appreciated.

4. Disposal of Wire Cut Away

When electric mains are cut away and lengths of wire in excess of one (1) yard are recovered, the officer attending will coil the wire recovered and attach to it a label stating the location at which the wire was cut away, the approximate length of wire recovered and the time and date of cutting away.

ITEM NO.1 - FALLEN OR DANGEROUS DISTRIBUTORS AND SERVICE LINES (CONT'D)

MAINS

- 3 -

4.1.65

The labelled coil of wire will be delivered by the officer concerned to a System Operation Branch Depot. The action taken and the relevant details shall be recorded on a service report.

The Supervisor Emergency Service Officers will arrange for the collection and return of the labelled coil of wire to Epsom Road Store.

SECTION NO.17

MAINS

ITEM NO.2 - OPEN CIRCUITED NEUTRAL SERVICE LINES OR CONNECTIONS
AT CUSTOMERS' PREMISES

1. Withdraw Fuses

Except in special circumstances, when a neutral service line or connection, the property of The Sydney County Council, is found to be open circuited at a customer's premises, the active fuses must be withdrawn from all service fuse boxes connected to the service or services associated with the open circuited neutral.

2. Maintaining Supply under Special Circumstances

(i) Disconnect 240 Volt Circuits

The open circuited neutral may affect a customer who requires to temporarily continue to use the 415 or 240 volt supply without a neutral connection:-

- (a) To maintain a process to prevent spoilage.
- (b) To continue melting of metals to prevent damage to furnaces.
- (c) To pump water to prevent flooding or to maintain water pressure for fire fighting.
- (d) For any other urgent reason.

If it is practicable to maintain the required supply by disconnecting all 240 volt circuits, the customer will be informed that the Emergency Service Officer will disconnect the 240 volt circuits, and that, at the customer's own risk, such apparatus that would function at 415 or 480 volts may be operated until the neutral is restored.

(ii) Emergency Service Officer to Stand By

When an Emergency Service Officer permits 415 or 480 volt apparatus to function temporarily at a customer's premises without the neutral being available, the Emergency Service Officer will remain at the customer's premises until the neutral has been restored.

SECTION NO.17

MAINS

ITEM NO.3 - OVERLOADED MAINS AND APPARATUS

1. Overloaded Mains and Apparatus likely to Cause Fire or Unnecessary Operation of Service Fuses

When it is known or believed that mains and apparatus, the property of The Sydney County Council, installed at customers' premises, or the customers' mains and apparatus are overloaded and likely to cause fire or unnecessary operation of the service fuses, Emergency Service Officers will report the circumstances as soon as possible to the Despatch Officer, either by telephone or radio and will confirm such reports by written service reports.

Despatch Officers, during general working hours will telephone urgent cases of overload to the appropriate Mains Depot, or the Supervisor Installation Inspectors, according to circumstances, immediately after receipt of verbal advice from the Emergency Service Officer. When the report of an urgent case is received by the Despatch Officer outside general working hours, the matter will be reported to the appropriate Mains Depot or the Supervisor Installation Inspectors by telephone at 8.00 a.m. on the next general working day.

In order that any additional information required by the Mains Depot or the Supervisor Installation Inspectors may be obtained readily, Emergency Service Officers reporting urgent cases during general working hours will "standby" on either the telephone or radio until otherwise directed by the Despatch Officer

Where it is considered to be desirable for safety reasons, the customers may be requested to temporarily restrict their loading until the position is corrected.

2. Overloaded Service Fuses

When it is reasonable to believe that service fuses are being subjected to continual overloading, Emergency Service Officers will examine the customer's installation and estimate the loading of all apparatus normally used at any one time.

If the customer's installation can safely carry the estimated loading, the existing service fuses will be replaced, where possible, with a standard service fuse of sufficient rating to carry the required loading.

Except for 200 ampere or 300 ampere service fuses which are to be linked, if a standard service fuse of a higher rating cannot be fitted into the service fuse box or cabinet, a new standard service fuse of the existing rating will be bridged with 20 gauge tinned copper wire threaded through asbestos braiding.

ITEM NO.3 - OVERLOADED MAINS AND APPARATUS (CONT'D)

Sufficient strands of 22 gauge wire, in accordance with the schedule given in Section 10 Service Fuses - Item 21 governing Ceramic Bridge Service Fuses will be used so that the service fuse, together with the bridge will be of sufficient rating to carry the estimated loading.

When Emergency Service Officers have increased the rating of service fuses, the facts, together with details of the estimated loading, must be shown on a Service Report.

Records Cards concerning overloaded Service Fuses will be forwarded to the Chief Installation Inspector who will measure the loading and advise the Mains Service Officer.

3. Repeated Visits To Customers' Premises

When a customer advises an Emergency Service Officer that repeated visits have been necessary to the premises for the same cause in each case, or where an Emergency Service Officer knowingly visits a customer's premises repeatedly because of the same defect, the circumstances must be indicated on a Service Report.

Despatch Officers will refer Record Cards and Service Reports in these instances to the Emergency Service Supervisor.

4. Service Greatly in Excess of Requirements

Emergency Service Officers will draw special attention on their Service Reports to customers' premises at which the Sydney County Council's mains and apparatus are greatly in excess of requirements and where services of a much lower standard rating could be installed.

Record Cards will be forwarded to the Mains Service Officer (M.S.O.).

SECTION NO. 17

MAINS

ITEM NO. 4 - NO SUPPLY AT SERVICE FUSES

When an Emergency Service Officer attending to a request for service arising from the failure of the electric supply finds that there is no supply at The Sydney County Council's service fuses and it is evident that the fault does not lie at the point of attachment or in the customer's service wiring, he must check the supply at one or two convenient neighbouring premises (making sure that the check is made on the same phase) to ascertain that a general supply failure has occurred. He shall then immediately notify the Despatch Officer - Co-ordination of all the available facts, and standby pending further instructions from the Despatch Officer - Co-ordination. The time the Despatch Officer - Co-ordination was notified must be shown on the officer's run sheet.

The Despatch Officer - Co-ordination will refer the matter to either the System Operator or the Mains Branch or will take such action as is necessary according to the circumstances. If the case is to be referred to the System Operator, the Emergency Service Officer will be directed to standby pending further instructions as the System Operator may require the Emergency Service Officer to make further investigation.

All officers must bear in mind at all times that prompt notification of cases of "No Supply" may enable the System Operator to expedite the restoration of supply to the whole or part of an area supplied from a distribution centre (substation or pole transformer).

Should an Emergency Service Officer, on determining that there is no supply at the Council's service fuses, find that these fuses are supplied by means of wiring in conduit from an underground service in an adjoining building, and that this wiring has become defective, the Emergency Service Officer shall immediately refer the job to the Despatch Officer - Co-ordination for urgent attention.

The Despatch Officer - Co-ordination outside normal working hours shall refer the matter to the System Operator for his attention. During normal working hours, he will confer with the Mains Branch Foreman and hand over the job of restoring the wiring to either the wiring staff or the Mains Branch, or take any such action as is necessary in the circumstances.

ITEM NO. 4A - RESTORATION OF SUPPLY AT PREMISES WITH UNDERGROUND SERVICES

When the supply to premises supplied from an underground service has failed and it is found that there is damage or deterioration to the service fuse fittings so that full supply cannot be restored by merely replacing a blown fuse or fuses, every effort must be made to restore as much of the customer's supply as possible by such means as connected temporary fuses external to damaged fuse boxes, or connecting circuits onto other phases where the service is two or three phases, after having isolated any three phase motors.

ITEM NO. 4A - RESTORATION OF SUPPLY AT PREMISES WITH UNDERGROUND SERVICES
(CONT'D.)

This is particularly important outside normal working hours, as it is Council's policy that underground staff are not called out when only one building has lost supply. These cases are deferred until the next working day, so that unless some temporary arrangements are made by the Emergency Service Officer, the customers will be without supply for some time.

The details of any temporary repairs carried out shall be reported to the Radio Telephonist.

4. Authority for Emergency Service Officers to Reconnect Supply.

Emergency Service Officers shall not reconnect the electric supply except at the direction of the Despatch Officer or the System Operator. If the supply is found to be disconnected and no reason for the disconnection can be found at the point of disconnection or on the records available at Head Office, the Despatch Officer shall instruct the Emergency Service Officer to reconnect.

5. Extent of Inspections to be made when Reconnecting Supply and Procedure to be followed when Access cannot be gained to inspect or connect.

Emergency Service Officers connecting supply at customers' premises shall examine the main switch and test the main earthing. If access can be had to the rest of the installation, a cursory examination only for dangerous defects will be made.

When access can be obtained to reconnect supply but cannot be gained to the interior of the premises, supply shall be connected if the main earthing is in order, and the main switch shall be left open. A "Switch Open" Card (O.E. 20) (No.1570) shall be left on the premises and the Despatch Officer notified.

Where the test shows the installation to be ineffectively earthed, supply shall not be connected if access to the interior of the premises cannot be had, but a "No Access" Card will be left on the premises and the Despatch Officer shall be advised as soon as possible. A subsequent visit when access can be gained may disclose some condition that would, coupled with the defective earthing, make it dangerous to connect supply.

If it is not possible to obtain access to the service fuses or customer's switchboard, a "No Access" Card, with the word "premises" altered to "switchboard" or other word that applies, shall be left on the premises and the Despatch Officer notified.

When the customer is available but the key to enclosed control apparatus cannot be obtained readily, the Emergency Service Officer shall wait on the premises five minutes or so to allow the key to be obtained. If the key is not then forthcoming, A "No Access" Card is to be left and other work proceeded with.

6. Destruction of Disconnection Slips

Upon reconnection of supply at any premises, the officer connecting shall recover and destroy the Disconnection Slip left at the point of disconnection, unless instructed otherwise.

7. Recording of Meter Numbers and Readings.

Emergency Service Officers reconnecting supply at premises must at all times record on Service Reports the numbers and readings of the meters associated with the installation.

8. Resetting Maximum Demand Indicators.

Emergency Service Officers will reset Maximum Demand Indicators only when connecting supply for a new occupant or at the special request of the Chief Installation Inspector.

Maximum Demand Indicators will not be reset when reconnecting after repairs or after default.

In general, instructions to Emergency Service Officers to reconnect supply shall be issued as follows:-

- (a) "Replace", or "Replace after Hours - New Customer."
- (b) "Type "D" Replace" (i.e. "Replace after Default").
- (c) "Replace after Repairs".

Resetting of Maximum Demand Indicators will be done only when instructions are received according to (a) above.

9. Premises Found Connected.

When, on visiting premises to reconnect supply at the request of the Treasury, the electric supply is found connected and correctly sealed, the markings on the seals of the meters and service fuses must be recorded on Service Reports, together with the meter numbers and readings.

If the markings on the seals are illegible, the seals are to be removed for forwarding to the Despatch Officer and the job will be resealed. The Despatch Officer shall attach the seals to the Reconnection (or "Replace") Form to be returned to the Treasury.

10. Reconnection Deferred Because of Defects in the Installation.

When, through defects in an installation, it is dangerous or not prudent to connect supply, a "Further Work" Card is to be left with the customer and the Despatch Officer advised as soon as possible.

11. New Work.

New installations are not to be connected by Emergency Service Officers under any circumstances without the express authority of the Chief Installation Inspector through the Despatch Officer.

When new work which has not been passed by the Chief Installation Inspector is encountered, the new wiring must be left disconnected.

If the installation comprises partly old wiring and partly new, supply shall be given to the old portion if the new wiring can be isolated.

If the new wiring cannot be isolated, supply to the whole installation shall be left disconnected and the Despatch Officer Co-ordination advised without delay. The Despatch Officer Co-ordination will notify the Supervisor Installation Inspections immediately if during general office hours, or at 9.00 a.m. the next general working day if after office hours.

12. Reconnection Where Meters Have Been Removed

Usually meters are removed only after premises have remained disconnected for twelve (12) months or more.

When the Customers' Accounts Section receives a request from a customer to restore supply at premises from which the meters have been removed, the practice is for the Treasury to request the Electrical Installation Superintendent to install the necessary meters and to replace the fuses.

Occasionally an Emergency Service Officer, when visiting premises to restore supply, will find that the meters have been removed. The Emergency Service Officer will have to determine by visual inspection of the premises and grounds whether there has been a recent occupant and the meters have been removed in error, or the premises have been unoccupied for twelve months or more.

If it is evident that the premises have been recently occupied, the Em.S.O. may give unmetered supply after inspecting the installation and finding it to be in order.

When an Emergency Service Officer is of the opinion that the premises have been unoccupied for more than twelve months, or this is substantiated by the finding of a dated disconnect slip, the following procedure shall be adopted:-

1. Visually check the premises required to be connected to ascertain that no dangerous defects exist.
2. Test earthing of installation.
3. Test installation with lamps to prove that the insulation of conductors are satisfactory.
4. If installation proves defective, refer customer to contractor listing defects on card N.O.1560. Refer to E.I.S.
5. Contact the Despatch Officer Co-ordination and advise of the condition of the installation and whether the installation could be connected giving unmetered supply.

The Despatch Officer Co-ordination will then contact a responsible officer from the Electrical Installation Branch to ascertain if the reconnection can be made giving unmetered supply. He will then instruct the Emergency Service Officer to either reconnect or leave disconnected as decided by Electrical Installation Branch.

It is to be distinctly understood that this Section does not apply in the cases of new work or alterations - such cases shall be treated as in Paragraph No. 11 - New Work.

When Sydney County Council meters or M.D.I.s become so defective that they affect the supply of electricity to customers' premises, unmetered supply may be given.

Unmetered supply may also be given when customers are inconvenienced by noisy meters.

Reporting Unmetered Supply

An Emergency Service Officer who gives unmetered supply to a customer shall affix a label in a prominent position to a meter or the customer's main switch, giving full information of the reason for giving unmetered supply. The label shall be signed and dated by the Emergency Service Officer. The Emergency Service Officer shall notify the Despatch Officer Co-ordination verbally of the action taken and shall also record the information by means of a memorandum on his run sheet.

Should an Emergency Service Officer, when visiting a customers' premises, find that the supply is unmetered, he shall endeavour to ascertain the reason for the condition and report details by means of a memorandum on his run sheet.

13. Premises Found Disconnected

(i) Reporting to Despatch Officer - Co-ordination

When Emergency Service Officers find, on attending premises in response to a call for emergency service, that the electric supply has been disconnected, the particulars, including date of disconnection, shown on the Disconnection Slip found at the point of disconnection must be reported to the Despatch Officer - Co-ordination immediately.

If no Disconnection Slip is found, the facts shall be fully reported to the Despatch Officer - Co-ordination and the seals will be removed and attached to the Daily Run Sheet for the attention of the Emergency Service Supervisor.

SECTION NO.17

MAINS

ITEM NO.5 - REMOVAL OF SERVICES TO PERMIT OF DEMOLITION OF BUILDINGS

1. In General Working Hours

When requests are received during general working hours for the removal of services to allow of the demolition of buildings, the call will be transferred to the appropriate Mains Depot.

2. After General Working Hours

After general working hours customers will be informed that it will be necessary to pay any charges that may be involved. In most cases, the charge made will be the difference in the costs of carrying out the work involved at overtime rates and ordinary rates of pay.

Although no charge is made in certain circumstances, an Undertaking Form must be signed on all occasions for work of this nature to be carried out after general working hours.

Usually a request for removal of a service will be made by the demolition contractor, but it is the owner or customer who should sign the Undertaking Form.

The Contractor's signature will be accepted only when it is not possible to obtain the owner's or customer's signature.

When satisfactory arrangements as to the signing of the Undertaking Form have been made, a Record Card showing full details of the service to be removed and information as to the collection of the signed Undertaking Form will be passed to the System Operator for attention.

SECTION NO.17

MAINS

ITEM NO.6 - LOCATION OF UNDERGROUND ELECTRIC CABLES

1. General

Occasionally persons engaged in excavating in footpaths or roadways may make enquiry regarding the location of electric cables. The following general information is set down for the guidance of officers called upon to answer these enquiries.

When practicable cable under footpaths is laid from one foot to four feet from street alignments and at depths of 1 ft. 6 in. and 2 ft. 6 in. depending on the type of cable. Service connections across footways are generally laid at a depth of 1 ft. 6 in.

The positions of cables under roadways depend on the positions of pipes and cables laid by other bodies, also on the construction of the roadway, and vary considerably; generally they are at a greater depth than cables under footways.

It is important to note that, although The Sydney County Council endeavours to lay its cables at uniform distances from street alignments and at uniform depths, in many cases it is necessary to make deviations and to increase or decrease the depths at which they are laid in order to avoid obstructions, also that sometimes after cables are laid alterations are made to levels and alignments of footpaths and roadways which alter the relative positions of the cables with regard to the surface of the footpath or roadway and the street alignment.

The Sydney County Council keeps records of the positions of its cables on maps which may be seen on application to the officer in charge of the Street Openings and Mapping Section at the Queen Victoria Building. Every care is taken to make these maps accurate, but The Sydney County Council cannot, for the reasons given above, guarantee that cables will be in the exact positions shown.

Some of the earlier cables laid are in wood troughing without a covering of tiles or concrete, and are not easily recognised, particularly if the wood has rotted away; especial care should be taken in excavating in such cases. Other cables have, at times, been covered with common bricks instead of earthenware tiles or concrete covers.

2. Methods Used by The Sydney County Council for Laying Electric Cables Underground

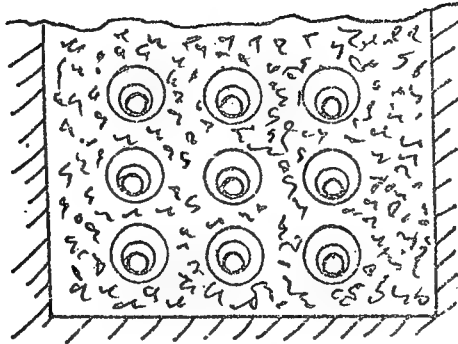
Attached to this instruction are sketches illustrating the methods used by The Sydney County Council for laying electric cables underground.

MAINSITEM NO. 6 - LOCATION OF UNDERGROUND ELECTRIC CABLES (CONT'D)3. Damaged Underground Electric Cables

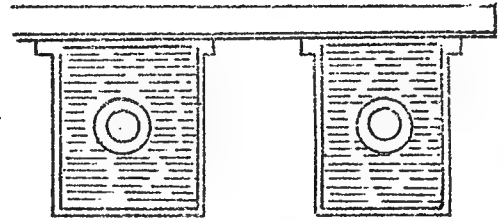
Underground electric cables are easily damaged by picks, shovels, mols, etc., even if slightly damaged they are liable to fall at any moment and may cause injury to anyone working near.

Persons making enquiries concerning the position of underground electric cables in relation to excavations are to be advised that if a cable is damaged or suspected of being damaged The Sydney County Council should be notified promptly by telephoning 2 0633 and asking for "Electricity Service."

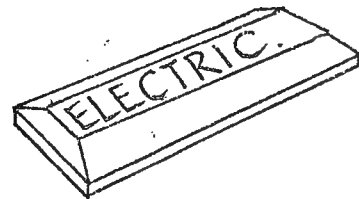
METHODS IN USE BY THE SYDNEY COUNTY COUNCIL FOR
LAYING ELECTRIC CABLES UNDERGROUND.



Lead Sheathed Cables pulled into
 Ducts surrounded by concrete.



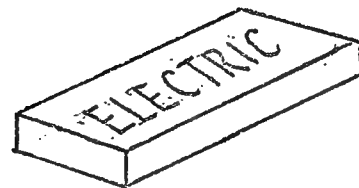
Lead sheathed cables laid in
 wood or fibre or fibro troughing
 filled with bitumen and covered
 with earthenware tiles.



Concrete slab for covering
 cables.



Lead Sheathed Armoured Cables
 laid direct in the ground
 about nine inches apart and
 covered with earthenware
 tiles or concrete slabs.



Earthenware Tile for
 covering Cables.

ITEM NO. 7 - LINE CLAMPS

Line clamps are provided for the purpose of connecting customers' service wiring to the overhead service lines of The Sydney County Council.

The line clamps are available in the following sizes, viz:-

A suitable for connection of cable 7/.044 to 7/.064

B " " " " 7/.080 to 7/.064

C " " " " 7/.083

Emergency Service Officers carry A, B and C clamps in vehicles. Size D are not carried by System Operation Branch.

A special bakelite cover or shroud is provided for insulating A type line clamps.

When using line clamps, cut away the minimum amount of cable insulation so that all exposed metal will be effectively covered when the bakelite covers are fitted.

Insulating tape carried by Emergency Service Officers will be used for insulating B and C line clamps.

Replacement stocks are available in all Emergency Service Officers' Depot stores lockers.

SECTION NO.17

MAINS

ITEM NO.8 - DEFINITIONS

The following definitions are provided for the information of Emergency Service Officers:-

1. Distributors

Cables that conduct the electric supply from the distribution centres along public highways.

The cables are generally erected with the neutral placed nearest to the house alignment, then A, B, and C, phases in that order.

2. Street Lighting Mains

Cables used in street lighting circuits, located above the distributors.

3. Service Lines

Cables that connect the customer's installation to the distributors.

4. Customers' Service Lines

When it is necessary to have one or more poles erected on the customer's property to support the lines between The Sydney County Council's pole and the point of attachment, the portion of the lines before the first pole is referred to as "service lines" and the remainder as "customers' service lines".

5. Suspended Service

Service lines forming the letter "T", suspended between two poles. Used when it is not desirable to cross the neighbour's property. Sometimes referred to as a "Flying fox service".

6. Bond

The short length of cable connecting a distributor to its extension.

7. Service Tap

The cable connecting a service line to a distributor.

8. Pole Raiser

The timber attached to the top of a pole to provide additional height and/or the necessary clearance between Sydney County Council and P.M.G. lines.

SECTION NO. 17

MAINS

ITEM NO. 8 - DEFINITIONS (CONT'D)

9. Point of Attachment

The point where the service lines are attached to the customer's premises and connect with the service wiring (consumer's mains).

10. Point of Entry

The point where the service wiring enters the premises.

11. Line Clamps

Provided for connecting the service wiring tails to the service lines.

12. Neutral Connections at Service Lines

With the progressive change over of the Sydney County Council reticulation to the M.E.N. system, and to ensure that a positive connection is made on the neutral conductor, the Mains Branch Instruction provides that two (2) line clamps are to be used on all neutral connections of jumper wires to service lines, this also identifies the neutral visually.

Emergency Service Officers will now, when connecting at point of attachments connect the neutral service wire to the Council's service line with two (2) line clamps to ensure a positive connection,

When connecting jumper wires from service lines to Mains connection boxes, Emergency Service Officers are to twist all conductors tightly with pliers. The neutral conductor must then be wrapped with sealing wire to prevent any possibility of an open circuit of neutral at this point.

THE FIRST OF THESE IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE. THE
SECOND IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE THIRD IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE FOURTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE FIFTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE SIXTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE SEVENTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE EIGHTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE NINTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE TENTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

THE ELEVENTH IS THE FACT THAT THE
COUNTRY IS A DEVELOPING ONE AND THE
ECONOMY IS NOT YET STABLE.

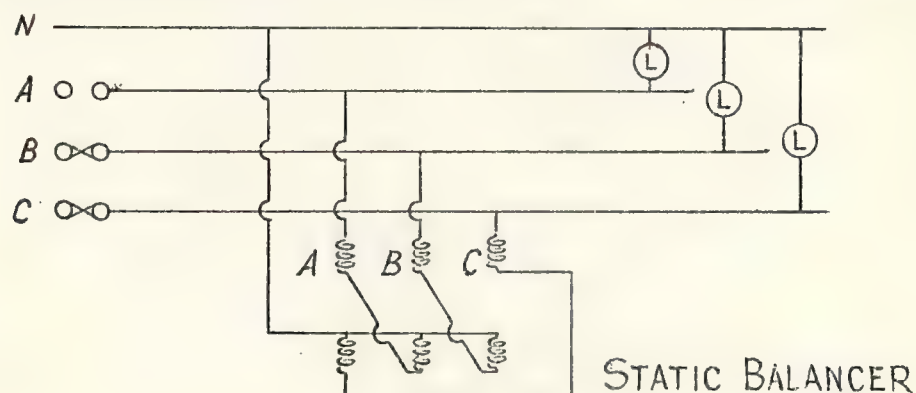
SECTION NO. 17ITEM NO. 9 - LOW VOLTAGE STATIC BALANCERS

There are about 200 Low Voltage Static Balancers installed on the Council's low voltage networks (this includes Sutherland Area).

Static balancers are used to improve voltage conditions on low voltage distributors having considerable out-of-balance current at various times during the load cycle.

The balancer diverts some of the out-of-balance current from the neutral, returning it via the zig-zag windings to the other phase conductors. If the load is normally balanced, no current flows through the balancer.

Operating staff investigating complaints of no supply or low voltage may encounter below normal voltage conditions, if for some reason, a distributor fuse has blown. The abnormal voltage conditions are due to the interphase effect of the static balancer.



For example, if "A" phase low voltage fuse had blown due to say a branch of a tree contacting the low voltage mains, then the conductor on the load side of the fuse would have a voltage induced into it from the balancer, which would be in phase with "A" phase of the transformer. Depending on the load connected to "A" phase, this voltage could approach the transformer voltage, but could drop appreciably when the distributor was loaded.

As shown in the diagram above, each phase of the balancer comprises two windings wound on different cores. Thus, as "B" phase windings are energised in the normal manner, the lower winding on the centre leg has a voltage induced into it. Similarly, "C" phase induces a voltage into the upper winding of the left-hand leg, and these two voltages combine to give a voltage which is in phase with the original "A" phase.

"B" and "C" phases in this case, therefore, tend to carry the load of "A" phase via the balancer. For small loads this may pass unnoticed, but as the load increases, "A" phase voltage drops and the balancer (which is only

ITEM NO. 9 - LOW VOLTAGE STATIC BALANCERS (Cont'd)

total at either 10A or 16.7A phase - 30A or 50A neutral) may burn out and/or even catch on fire.

A burnt out balancer is therefore, not necessarily the cause of a low voltage fuse operation, and a thorough inspection of the low voltage distributor for the source of the trouble should be made in such cases.

While Emergency Service Officers will not be required to carry out any work on static balancers, they should be alert to recognise the voltage conditions which can be produced using this equipment and report any abnormal voltage conditions.

When alterations are made to the low voltage system such as by installing additional distribution centres, so that the voltage conditions are changed, existing static balancers may be moved to new locations or removed completely.

ITEM NO. 10 - TREE TRIMMING

When customers make enquiries from Emergency Service Officers regarding the trimming of trees, fouling of service lines, or distributors, they shall be advised in accordance with the following procedure:-

1. Procedure - Trees on Private Property

- (a) When a tree stands on private property and is endangering the Council's service mains, the tree will be trimmed if requested by the customer, but only at the customer's cost. The Line Inspector will leave cards No. 50 and No. 30 requesting the customer to have the tree trimmed or to agree to the trimming being carried out by the S.C.C. at the customer's cost. (Fig. No. 1.)
- (b) When a tree stands on private property and is endangering the Council's street mains, the tree will be trimmed at the Council's cost. The Line Inspector will leave card No. 55. (Fig. No. 2).
- (c) When a tree stands on private property and is endangering service mains crossing that property to supply the adjoining premises, the tree will be trimmed at the Council's cost. The Line Inspector will leave card No. 55 with the customer on whose property the tree is growing. (Fig. No. 3.)
- (d) When service wires which do not cross property are endangered by a tree standing on the adjoining property, the customer concerned will arrange with the adjoining owner to have the tree trimmed. No card will be left but the Line Inspector's report will be forwarded by the Foreman to the Mains Service Supervisor for a letter to be written to the customer. (Fig.No.5).

2. Permission to Trim Trees

Trees will not be trimmed by this Council's staff without prior permission being obtained from the owner of the land on which the tree stands, or the local council, as the case may be. In the case of local councils, fourteen (14) days' notice of intention to cut trees must be given. This rule can only be relaxed when it is apparent that delay in trimming trees could be dangerous, but in such cases, the matter must be drawn to the owner's or local council's notice as soon as possible.

3. Removal of Mains During Tree Trimming

Where a request is made for the temporary removal of service mains whilst trees are being trimmed or felled, the cost will be charged to the customer concerned. However, if the service wires cross the adjoining property and a tree in that property is involved, the mains will be temporarily removed without charge.

Any arrangements required to be made by customers shall be made with the Mains Service Office.

When customers make enquiries from Emergency Service Officers regarding the trimming of trees, location of service lines or other matters, they shall be advised in accordance with the following procedures:

Procedure - Trees on Private Property

- (a) When a tree stands on private property and is endangering the Council's service mains, the tree will be trimmed if requested by the customer, but only at the customer's cost. The line inspector will leave cards No. 50 and No. 52 requesting the customer to have the tree trimmed or to agree to the trimming being carried out by the Council. (Fig. No. 1)
- (b) When a tree stands on private property and is endangering the Council's street mains, the tree will be trimmed at the Council's cost. The line inspector will leave card No. 52. (Fig. No. 2)
- (c) When a tree stands on private property and is endangering service mains crossing that property to supply the adjoining premises, the tree will be trimmed at the Council's cost. The line inspector will leave card No. 52 with the customer on whose property the tree is growing. (Fig. No. 3)
- (d) When service wires which do not cross property are endangered by a tree standing on the adjoining property, the customer concerned will arrange with the adjoining owner to have the tree trimmed. No card will be left but the line inspector's report will be forwarded by the Foreman to the Main Service Supervisor for a letter to be written to the customer. (Fig. No. 4)

Referral to Local Trees

Trees will not be trimmed by this Council's staff without being referred to the local authority, as the Council's staff are not permitted to enter private land. In the case of local authority trees, notice of intention to cut trees must be given. This rule can only be waived when it is proved that delay in trimming trees could be dangerous, but in such cases the matter must be drawn to the owner's or local authority's notice as soon as possible.

Removal of Trees on Private Property

Where a request is made for the temporary removal of service mains whilst trees are being trimmed or felled, the cost will be charged to the customer concerned. However, if the service wires cross the adjoining property and a tree in that property is involved, the wires will be temporarily removed without charge.

FIG.1
Customer's Cost

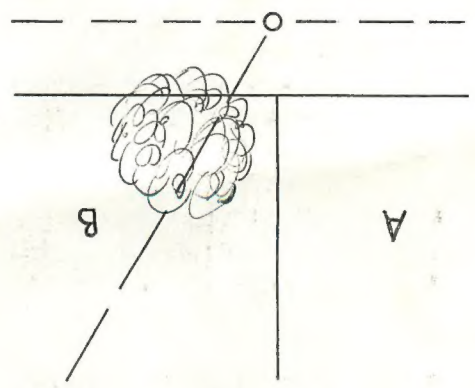


FIG.2
Council's Cost

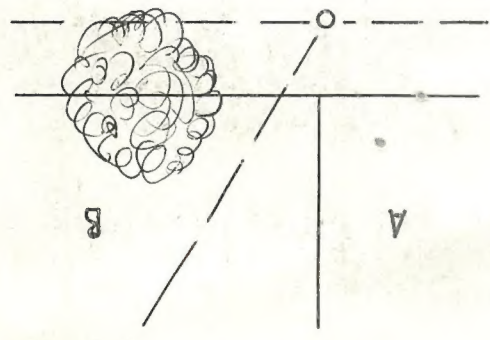


FIG.3
Council's Cost

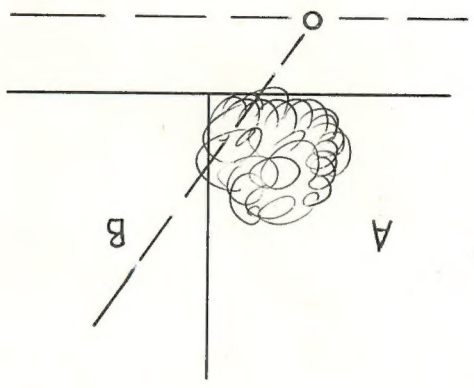
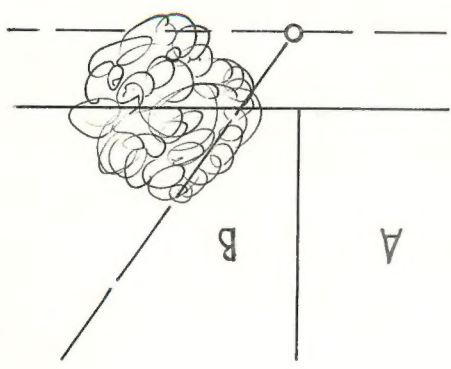


FIG.4

Both Positions of Council's Cost



TREE TRIMMING

ATTACHMENT ITEM N°10

"B" to approach "A" to cut
tree of "A's" cost.

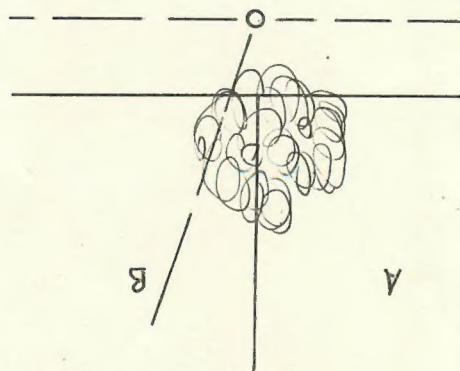
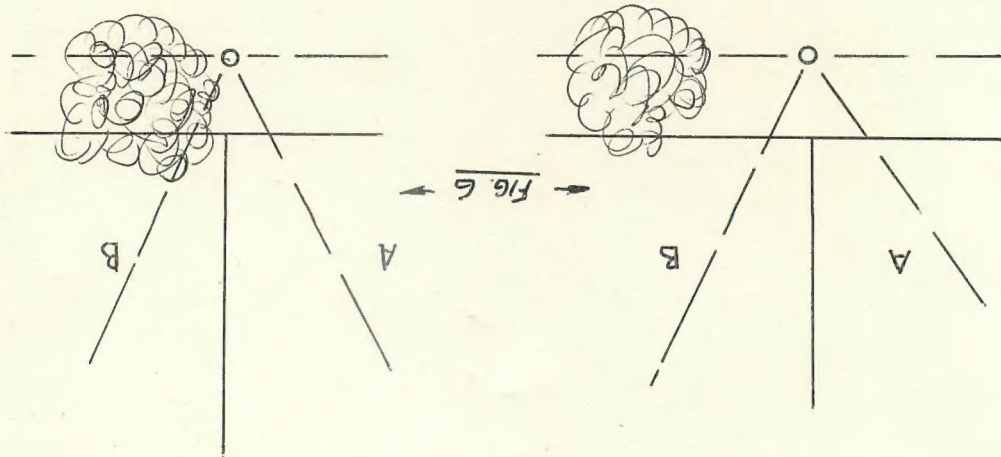


FIG. 5



Both Cases : Natural trees to be trimmed at SCC cost.

Planted trees to be trimmed at local Council's cost



110 =

